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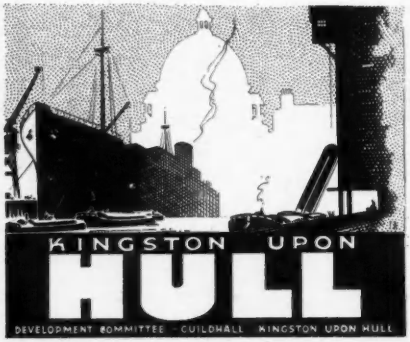

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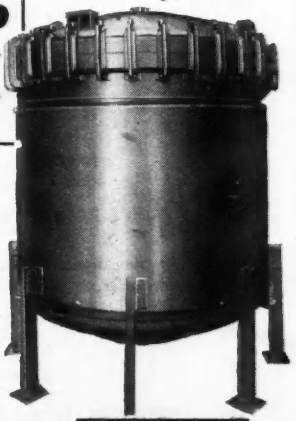

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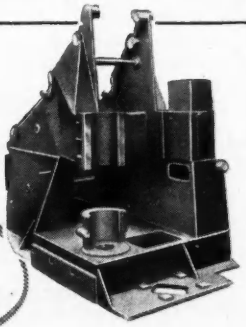

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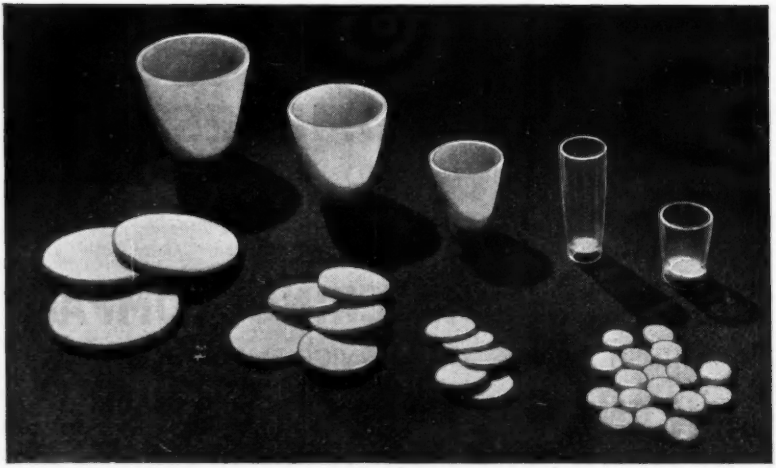

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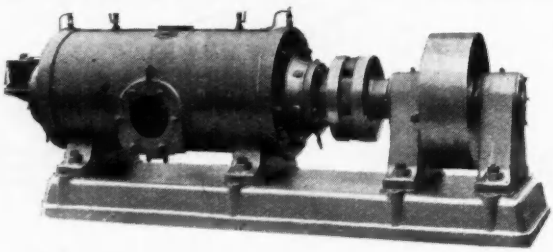

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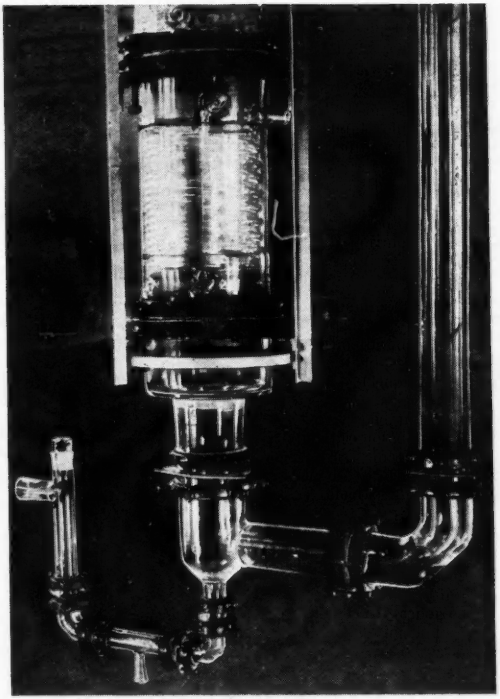

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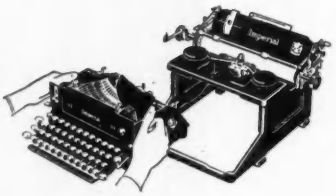

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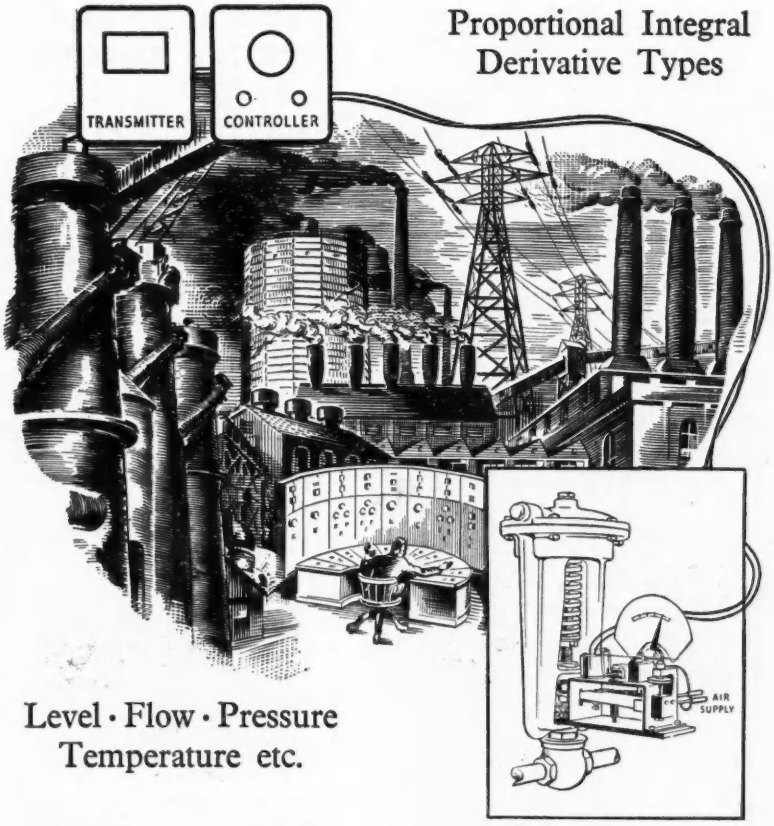

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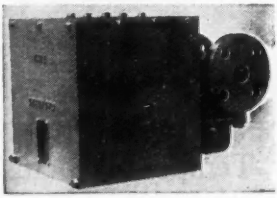

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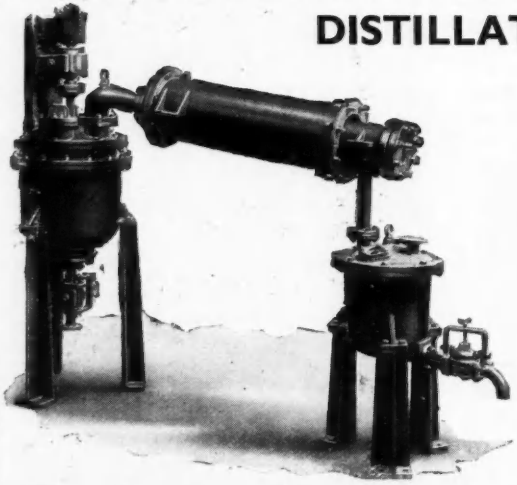

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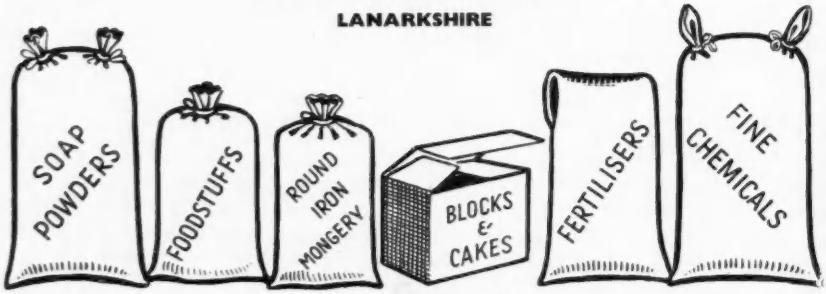

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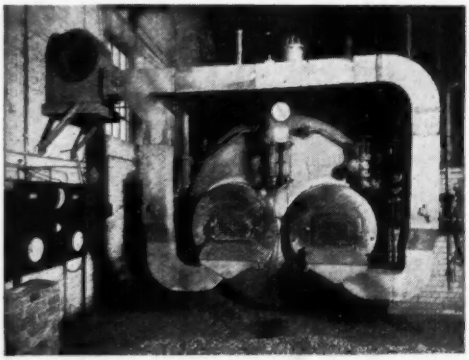

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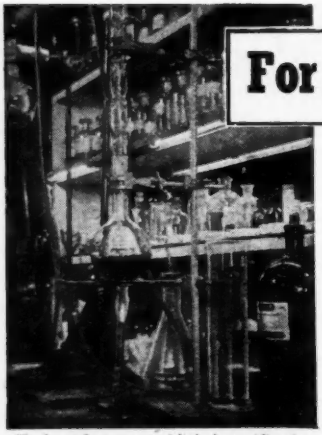

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Planning a Second Ruhr?

VAST explosions in Germany during the war and since have convulsed what was one of the chief sources of some essential chemicals in the Western hemisphere. When war ended it was widely accepted that what remained of the great chemical edifice, built up so largely by the I. G. Farbenindustrie, would be handed over to the housebreakers with orders which would have resulted in leaving standing very little more than the skeleton. That was an understandable decision by peoples who had good reason to know what chemistry misapplied could do, and it required nearly two years before the more far-seeing view was taken by the Western Allies of the essential functions in Continental Europe which German chemistry would be required to perform.

Now, because of mistrust lamentably like that which at first coloured all Allied dealings with the former enemy, the kaleidoscope is beginning to present once again a new pattern. In this, what might naturally have again been the focal point of chemical supply industries in Central Europe has been bisected and the fragments exhibit a determined tendency to fly apart and coalesce in mutually repelling Eastern and Western groupings. The firm policy of the Soviet administration seems now to have been revealed fairly clearly in the wholesale removal of chemical and heavy industry plant, and which was thought at the time to be excesses resulting from the exuberance of victory.

It is stated that of what remains of chemical industry in the Soviet zone a large proportion is now under the control of Soviet corporations purely for the benefit of the U.S.S.R. Just over 35 per cent is reported to have been "socialised" under the direction of 10 associations concerned with inorganic chemicals, organic chemicals, potash, coal oil products, carbide and technical gases, plastics, paints, soap, detergents, pharmaceuticals and technical chemicals.

The fact that has long been evident, that no complementary development of German chemical industry as a whole can be achieved, has received fresh proof from recent indications of policy in Central and Eastern Europe. These are chiefly the reports about an ambitious industrial development plan worked out jointly by the Czechoslovak and Polish Governments and aiming at no less than the establishment of a "second Ruhr" in Lower Silesia. It is worth while to try to put this plan—which was discussed by the joint Polish-Czech Council for Economic Co-operation in Warsaw at the beginning of this month—into perspective. It is clear that its implementation would materially alter the industrial structure of Central and Eastern Europe quite apart from its political and strategic consequences. The area in question contains

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some of the best coal to be found on the Continent, zinc-ore, steel plants, chemical works, power stations and a well-developed transport system, to which a new canal linking the Oder with the Danube and thus the Baltic with the Black Sea, would be added, according to the new plan. However, a complete and lasting integration of the heavy industries of Czech and Polish Silesia, while by no means impossible, will undoubtedly be a formidable long-term task. Moreover, it is unlikely that such a large-scale development scheme can soon be attempted with any hope of success—the chief obstacle being the lack of capital goods. Furthermore, the availability of a well trained labour force and of a sufficient number of experts must also be considered as uncertain.

The project for a "second Ruhr" is not quite as novel as may appear at first sight; in fact the Germans were anxious during the war to expand the industrial potential of Silesia, and because of the Allied bomber offensive a number of firms were actually transferred from West Germany to this area. However, even the Germans had to admit that a "second Ruhr" could not be developed within a few years, but that this would rather be a task for one or more generations. The parallel with the so-called "second Baku" is appropriate. It is well-known that in spite of all the effort expended by the Russian Government to lessen their reliance on the old oilfields in the Caucasus by developing a "second Baku" beyond the Volga, the contribution of the latter has so far fallen much below expectations.

It is reported that Russian experts play an important part in the discussions about the further development of Silesia, but the U.S.S.R. Government does not as yet appear manifestly to enter into it. It is unlikely, however, that a scheme of this magnitude could be undertaken without Russian participation. Qualified observers point out that the plan for a "second Ruhr" in East Europe is the Soviet Union's counter-move to the inclusion of West Germany into the Marshall-Plan. Since the U.S.A. has started to scrutinise carefully exports of raw materials and capital goods to Russia and her satellites, the latter, Czechoslovakia and Poland in particular, have lately increased their efforts to obtain these supplies from Switzerland, Sweden and Belgium. The dependence of East Europe on imports of these essential supplies would therefore be lessened or altogether eliminated if the plan for an intensive industrialisation of Silesia could be carried out. However, the fact must not be overlooked that a "second Ruhr" would depend on an uninterrupted supply of Swedish iron-ore (which has for decades been used in Silesia).

NOTES AND COMMENTS

Record Exports

MORE convincing than almost any other indication of ultimate relief from present troubles, the provisional record of U.K. exports in July, representing an income higher than any previously achieved in our history, reflects the fact that the call for increased production has evoked a response from most industries worthy of comparison with what was done under the compelling demands of war. When it is remembered how many of the larger contributing industries are still impeded by the scarcities of steel and to some extent of raw materials, the overseas sale during July of U.K. goods worth £145.6 million, £11.6 million more than the previous month's high record, the vitality of our productive capacity is not a subject for doubt. Some allowance has to be made for the additional working days which this July afforded and for the continued appreciation of values, but the volume result, 40 per cent more than was exported in 1938, is reliable evidence that what has been achieved is no mere "paper" record. Particularly satisfactory is the knowledge that the main stream of chemical industry contributed proportionately more than most others to the expansion of overseas trade.

Chemical Totals

THE increase achieved in foreign sales of basic chemicals, compared with what was provided a year ago, represented by the cash totals for July of £4,001,766 in 1947 and £4,520,840 this year, is by far the most stimulating of the factors which helped to raise the grand total for chemicals, drugs, dyes and colours by some £404,000 above the previous July figure to £7,581,387. Had proportionately the same results been secured by the other branches of chemical production the total improvement would have been phenomenal. Sales of drugs, however, were reduced by £310,000 compared with the 1947 total and the relatively small increases registered by the dyestuffs and pigment groups were insufficient to redeem the total. While the newly instituted control of foreign trading in dyestuffs has not yet influenced the July total of £756,655, it is widely believed that future monthly returns of actual export sales will not be seriously affected. The promising characteristic of nearly all other categories of chemical production was the wide distribution of trading increases over various fields of production and markets. Of the latter, the Commonwealth countries, South-East Asia and, for some commodities such as agricultural chemicals, the Argentine, have provided fresh evidence of their continued dependence upon the traditional suppliers in this country.

Robert Maclaurin

THE belief that more individualistic and colourful characters have been recruited by chemistry from the Royal Technical College—Glasgow's old "Andersonian"—than from any other equivalent training centre is possibly an illusion, but, if so it is one which events conspire to perpetuate. The impression is certainly not lessened by the warm recollections which accompany the sense of loss evoked by the news, reproduced elsewhere in this issue, of the sudden and unexpected death in Glasgow—from heart failure—of Robert Maclaurin, whose appearance and philosophy suggested the artist rather than the practical man of science, which his original achievements in the development of low temperature carbonisation and in fuel technology proved him to be. The forthright personality which the traditions of the old Andersonian College helped to form seemed to have been accentuated rather than stunted by friction with less lively minds and the reactionary policies with which he had sometimes to contend and, as if to symbolise his inflexible resistance to all that, his exuberant maroon bow tie proclaimed where he stood. He was in fact an artist and was the founder of a guild of handicrafts in Glasgow to sell works of craftsmanship. However, anyone not knowing his record who mistook him for a dilettanti was quickly disillusioned by his adroit handling of facts and figures at the technical meetings on fuel in Glasgow, which he always attended.

Dangers Unforeseen

HAZARDS in various phases of chemistry and a variety of safeguards formed the subject of several articles in THE CHEMICAL AGE last week.

one of which described at some length the elaborate precautions built up by the designers of the $3.5 million laboratories sponsored by the U.S. Bureau of Mines to develop the technology of synthetic liquid fuels at Bruceton, Pennsylvania. The impression given by our U.S. correspondent's account was that here, at least, explosion risks would be negligible. It now falls to be recorded that while that matter was being printed a large part of this "accident-proof" creation was reduced to rubble by an explosion which cost two lives and severely injured four. According to first reports, on the authority of Dr. H. E. Greenwald, superintendent of the laboratories, this tragic frustration of a promising attempt to banish the hazards associated with experimental work in highly volatile materials had its origin in an explosion outside the "safety zone." A cylinder of hydrogen under high pressure is thought to have been the cause of the blast which brought down four 30-ft. lengths of exterior wall and pulverised all the windows in the area. Commiseration with the victims and others involved will be accompanied by a renewed recognition of a self-evident fact which is often overlooked—that no internal security measures are of much avail while hazards go unchecked nearby. That disconcerting reflection (which has so close a parallel in the uneasy course of world affairs) has been justified by many disastrous occurences in recent times, and especially by the convulsion which wrecked Texas City in 1947.

"Closed Shop Science"

ANYONE holding the view that the extension of the "closed shop" principle to scientific research is one of the most effective means of arresting development will be interested to note what Prof. Henry M. Leicester told the 114th national meeting of the American Chemical Society in Washington last week of the shaping of scientific research in Russia. He was concerned with the historical aspects, rather than with the somewhat mysterious topic of what is taking place in Soviet laboratories today, and recalled that the present day policy of exclusiveness is not altogether new. There are curious parallels with the system fostered by the Czars over a period of several hundred years, founded upon the "importation" of foreign scientists, who were not slow to establish for themselves a privileged caste and to resist any attempt at infiltration, in this case by native scientists or students. In those conditions was developed a narrow school of scientists who contributed much to the exploitation of Russia's national resources, but made no major contribution to world chemistry. That, according to Prof. Leicester, was why nothing great came out of Russia until Dimitri Ivanovitch Mendeléeff in 1869 set forth the relationships of the chemical elements in the periodic table. "It was only for a brief period at the end of the 19th century that native Russian scientists overcame the power of foreigners and developed a school of chemists equal to that developed in any other country of the world," says Dr. Leicester. His words, in the light of the apparent imposition in recent years of an ideological straitjacket on those who might now be forwarding the growth of science throughout the world, have the nostalgic ring of a funeral oration.

Steel Prices Raised

MAXIMUM prices for iron and steel have been increased by a Ministry of Supply order, mainly because of rises in the price of coal. Prices of the majority of products affected have risen between 2s. 6d. and 3s. 6d. per ton, while others vary between 1s. 9d. and 5s. Largest increase is in the price of mild steel wire, and products and silico manganese wire, which have been increased by 27s. 6d. per ton. Wire rods of silico manganese quality are up 24s. per ton, as are re-rolled bars, sections and hot rolled strip and silico manganese bars. Other large increases affect billets, blooms and slabs for re-rolling, silico manganese billets, billets, blooms and slabs for forging, drop forging and stamping, all of which have risen 20s. per ton.

Some Belgian Imports

At the same time as the order was made the Treasury announced that the Government is to make a special purchase of 100,000 tons of steel from Belgium and Luxemburg to ease trade barriers. This purchase will be in addition to steel being obtained from the two countries under current trade agreements and "may involve the United Kingdom in a loss of gold."

Petroleum Chemical Projects

Sir Robert Robinson to Collaborate

PROPOSALS for the reorganisation of the capital of Petrocarbon, Ltd., and Petrochemicals, Ltd., designed to enable the latter company to raise additional capital, have been despatched to shareholders and noteholders of Petrocarbon, Ltd., and a meeting of the "B" noteholders has been convened for September 10. Application has been made to the Treasury for consent to raise £2,500,000 to finance the completion of the "Catarole" plant which is being erected at Partington, near Manchester, and to finance the initial development of a number of associated projects.

Among these, Styrene Co-Polymers Ltd. was recently formed jointly with Lewis Berger & Sons, Ltd. It will absorb Petrochemicals' total output of crude styrene for the manufacture of a styrene-based paint varnish. Arrangements have been made to form Oxirane, Ltd., jointly with Lankro Chemicals, Ltd., to produce and market certain chemicals based on ethylene and propylene derivatives from the Petrochemicals plant. Lankro Chemicals, Ltd., has carried out for many years special research in the production and development of these chemicals, most of which are at present imported from the United States.

A long-term agreement has been concluded with British Paints, Ltd., for the off-take of the entire production of Petrochemicals' indene resins.

Sir Robert Robinson, president of the Royal Society, has accepted an invitation to join the boards of Petrocarbon, Ltd., and Petrochemicals, Ltd., when the financial proposals have been implemented.

Considerable progress is reported to have been made in the erection of the Catarole plant. The directors state that they are satisfied that, provided suppliers can keep to scheduled times for remaining deliveries, the first units of the plant should be started up by the end of this year, while the remainder will be in operation by the autumn of 1949.

British Indestructo Glass.—In his statement which was presented at the seventeenth ordinary general meeting of British Indestructo Glass, Ltd., the chairman, Mr. W. B. Mitford, referred to the new furnace for the automatic toughening and curving of glass, named the Acton Furnace, which is believed to be the largest and most economic in existence. He also announced that the company had entered into negotiations to increase its factory space by 70 per cent.

More Carbon Black

New Group to Operate Special Process

THE registration of a new chemical company that will save the country dollars, United Carbon Black, Ltd., was announced during the week.

Associated with United Kingdom Chemicals, United Carbon Black, Ltd., is a private company with a capital of £125,000, and listed as manufacturing chemists; manufacturers of chemical and allied products and substances of all kinds; coke, tar and gas producers; coal and tar distillers; refiners and treaters of coal and other minerals and their derivatives, and tar and other products.

25 Million lb. Yearly?

It is intended that the two firms will shortly be producing 25 million lb. of carbon black a year. A plant at Port Tennant, South Wales, is at present capable of producing 10 million lb. annually, but further plant is expected to step up the output.

It has been stated that a large part of this new production will be produced from indigenous materials by a secret process invented by a 44-year-old Russian scientist, Dr. Michael Steinschlaeger, who left Germany for this country in 1938 for political reasons. During the war, Dr. Steinschlaeger acted as an adviser to the Ministry of Economic Warfare.

This news follows reports (THE CHEMICAL AGE, July 24 and August 21) that a £1 million factory for the production of carbon black is to be erected at Avonmouth, Bristol, for the Palatine Development Company.

Courtaulds' Australian Factory

Conflicting reports continue to appear regarding the location of the new £5 million rayon factory to be established in Australia by Courtaulds, Ltd. Four States have now claimed that the new plant will be sited in their territory. The latest claim has been made by the Victorian Minister for Transport, State Development and Decentralisation, Mr. C. F. Stoneham, who, according to an Australian broadcast, said that it was likely that a Victorian site would be chosen.

In April, 1947, the New South Wales Prime Minister announced that the factory would be built at Hexham, near Newcastle, South Australia claimed it in 1946, mentioning six possible sites. This was followed by a claim from Queensland.

Courtauld's officials in this country and Australia say: "Negotiations have not yet been completed."

Production Records

U.S. Chemicals in 1947

REPORTS released last week by the U.S. Bureau of Mines indicate that new production or sales records were established in 1947 in the U.S.A. for potash, sodium sulphates and carbonates, boron minerals, bromine and calcium chloride operations.

Producers reported that production and sales of marketable potassium salts reached new record levels in 1947. Production was 1,965,776 short tons of potassium salts containing 1,029,875 tons of equivalent potash (K_2O). This was an increase of 218,041 tons of potassium salts over 1946, and 98,063 tons of K_2O. The production of marketable potassium salts in the U.S.A. has increased each year since 1934 and in 1947 the value of sales was over 24 million dollars.

Fluctuating Fertiliser Totals

Both imports and exports of fertiliser potash materials increased in 1947 but those for chemical uses declined. Domestic consumption of potash made a new high record, apparent consumption reaching 1,001,442 short tons K_2O. Production of both grades of muriate of potash was larger in 1947 than in 1946, while output of manure salts also increased.

Natural sodium sulphates and carbonates both enjoyed a record year. Sales of sodium sulphates totalled $3,329,094 and of sodium carbonates $5,862,178 in 1947. Natural sodium sulphate is used principally in the manufacture of kraft paper and glass, in stock feeds, as a flux in metallurgy, and in a new and rapidly expanding use in soapless detergents. Natural sodium carbonate is consumed principally on the Pacific coast, where it is used in glass manufacture and in alkali cleansers.

The record production of boron minerals in 1947 surpassed the 1946 output by 12 per cent (of boron trioxide). Output reached 501,935 short tons containing 145,700 tons of boron trioxide, compared with 430,689 tons of mineral containing 129,800 tons of boron trioxide sold or used by producers in 1946. Boron salts are used mostly in sheet steel enamels and glass. Minor outlets are fertilisers, soaps, medicines, and water treatment.

Sales of bromine compounds by primary producers in 1947 amounted to 78,177,650 lb. of contained bromine, valued at $14,837,104, 83 per cent more than in 1946. The major use of bromine is in making ethylene dibromide, one component of "ethyl"-gasoline. A new record was also set for sales of natural calcium (and calcium-magnesium): 271,206 short tons, valued at $2,650,205, an increase of 3 per cent over 1946.

German Soda Ash

Unique Brine System Used in Germany

A REPORT describing soda ash manufacture in Southern and Western Germany,* prepared by Frederick Nill and Raymond Largent, of the Solvay Process Co., Syracuse, New York, U.S.A., who investigated conditions in the industry in Germany under the sponsorship of the U.S. Office of Technical Services, cites what is described as a unique brine system used for this purpose in which the salt is dissolved underground by water piped into caverns of a salt mine. The brine system is operated by the Deutsche Solvay Works, at Rheinberg, Germany. After it is dissolved, the saturated brine is pumped through a pipeline up the main shaft and to the plant, a distance of about eight kilometres, the investigators state.

The Kali-Chemie firm, at Heilbronn, which also uses salt brine from wells, has deep wells using underground water flowing by gravity to dissolve the salt and an air lift to pump the saturated brine to the surface. At high rates of production the brine from the wells is not saturated and solid salt is added to the brine at the plant. Of the six firms observed by the investigators, three used salt brine from wells, and three purchased solid salt which they dissolved to produce brine. The six firms had a total rated capacity of 2260 tons of soda ash a day.

Few War Developments

In general, the report states, there was no evidence of aggressive or intensive research in the German soda ash industry. Plants were relatively old and were neither expanded nor modernised during the war years. The report discusses in detail brine supply and treatment in German plants, limestone supply and burning, carbonation, filtration of sodium bicarbonate, distillation and absorption of ammonia, calcination and steam decomposition of bicarbonate of soda, and power generation. Emphasising operating practices, plant capacities, and technical performance, the report contains drawings of typical equipment, and several tables of operating and cost data in addition to discussing several by-products.

* Copies of the 51-page mimeographed report, No. PB-81278, "Soda Ash Manufacture in Southern and Western Germany," may be purchased at $1.50 each from the Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C., U.S.A.

Private Chemical Companies.—According to a survey made by Jordan & Sons there were 318 registered private companies, with a total nominal capital of £1,286,400, engaged in chemical production in 1947.

Profits Drop as Sales Rise

Canadian Fertiliser Section's Experience

AN economic anomaly confronted the Canadian Government's Prices Commission during its recent investigations of the country's fertiliser industry, when it was shown that the profits of one of Canada's leading producers have steadily decreased although sales have risen by $7 million in the past nine years.

Reduced Earnings

The commission's first industrial witness, Mr. H. G. Smith, executive vice-president of Canadian Industries, Ltd., which produces about one-third of the chemical fertilisers used in Canada, presented figures which showed that in 1939 his company sold $4,287,000 worth of fertilisers, and made $210,000 profit. In 1947, however, the firm's fertiliser branch made only $201,000 in net income, although its sales had risen to $11,082,000.

The company's investment in this branch of its widespread activities had roughly doubled in the interim as the result of an expansion programme, which Mr. Smith said had been financed entirely from the company's earnings and without recourse to borrowed funds. The 1939 investment of $4,066,000 had risen to $219,000 in 1947. The earnings of this division of C.I.L., measured as a percentage return on capital, dropped from 5 per cent to 2½ per cent.

Use of "Fillers"

At one stage of the investigations discussion centred upon the use of inert fillers in prepared fertilisers. It was agreed that these fillers, chiefly plain sand or dolomitic limestone, contributed little in the way of soil nutrition. The witness said that his firm, in common with other producers, would like to eliminate them but always encountered "farmer resistance." He said that without fillers, a ton of fertiliser would cost more but, since it would be purer, it would prove more economic over a long period.

Canada used 657,282 tons of fertiliser in 1947, about 7 per cent of it in the five eastern provinces.

Uranium Developments in Canada.—Mr. J. H. Greenberg, president of the International Uranium Mining Company, Canada, states in his annual report that recent discoveries indicate the presence of new large ore deposits. The directors of the company feel that the Government's present minimum price of $2.75 a pound for uranium oxide is far too low.

Canada's Lac Imports

India Now the Chief Supplier

AN article in the July 24 issue of *Foreign Trade*, published by the Canadian Department of Trade and Commerce, states that India has now replaced the U.S.A. as Canada's chief supplier of lac.

Canadian imports from India of crude, seed, button, stick and shellac in 1947 totalled 14,277 cwt. ($772,451) as compared with 23,438 cwt. ($1,039,959) in 1946, 5228 cwt. ($44,237) in 1939 and 4414 cwt. ($41,347) in 1938. In 1937, 1938 and 1939, Canada's imports of lac came principally from the United States.

Increased Siamese Output

Before the second world war, India produced approximately 90 per cent of the world's supply of lac, the remaining 10 per cent coming from Siam, Indo-China and Burma. Refining of the raw lac into shellac and seedlac was confined to India.

Figures recently released indicate that Siam is now not only producing more lac, but is also refining it into shellac for direct export to foreign countries. During the first nine months of 1947, Siam exported approximately 10,000 tons of sticklac and 1500 tons of shellac as against a prewar annual average export of 5000 tons of sticklac, which went mainly to India. The annual production of raw lac in the whole of India is approximately 50,000 tons, which, when refined, yields from 25,000 to 30,000 tons of shellac and seedlac.

The article adds that although the development of synthetic resins has been a serious threat to the industry, the general opinion in India seems to be that, with improvements in heat resistance and mechanical strength, brought about by chemical modifications, a wide field of application which the synthetic resins have opened up can still be exploited by producers of shellac.

British Exhibition in Denmark

Notable in the display of British scientific instruments, which is being organised under the auspices of the Scientific Instrument Manufacturers' Association of Great Britain, at the exhibition of British goods to be held in Copenhagen from September 18 to October 3, will be an electroencephalograph, which measures the rhythms of the brain and is now being developed for the diagnosis of mental diseases. Many instruments for controlling the quality of foodstuffs will also be seen, including one which directly records the amount of sugar present in any foodstuff and which is being publicly displayed for the first time.

Royal Institute of Chemistry

London and S.E. Members' Works Visits

THE first of the July works visits of the London & South Eastern Counties Section of the Royal Institute of Chemistry was on July 8, when 24 members visited the Silvertown refinery of Tate & Lyle, Ltd. They were received by Mr. A. G. Powers, who briefly outlined the sugar refining process, and then they toured the works, starting with the landing of the raw sugar at the wharves and following the process through to the final packing of the refined sugar. At tea, Mr. Bowers answered questions on the sugar refining process.

Fuel Technology

The second visit, on July 13, was to the Fuel Research Station, Greenwich, when 25 members attended. Mr. Davis received them and gave a general survey of the work of the station. The visitors were shown the carbonisation plant, where the production of coke and smokeless fuel is studied; the calorimeter rooms, where the efficiencies of domestic heating appliances are investigated; the analytical laboratories and laboratories devoted to the study of the fundamental nature of coal and the chemistry of by-products of carbonisation; smoke elimination devices for marine and land boilers; and a pilot plant for the production of synthetic hydro-carbons by the Fischer-Tropsch process.

On July 17, seventy Kentish members and their guests visited the Wye College of the University of London, and heard a paper, read by Dr. R. L. Wain (head of the Chemistry Department), entitled "Recent Developments in Horticultural Chemistry."

A visit was made to the works of Pharmaceutical Specialities (May and Baker), Ltd., on July 21. The 27 visitors were received by Mr. W. D. M. Kemp and Dr. H. H. Barber and conducted on an extensive tour of the works. They were shown, *inter alia*, the manufacture of inorganic and organic chemicals, the filling and packing of ampoules, and the pharmaceutical research and analytical laboratories.

On July 20 a party of registered students visited the glassworks and scientific instrument factory of Baird and Tatlock (London), Ltd., where the works manager (Mr. H. E. Wheatley) conducted them round the glass-blowing, calibration and graduation shops. They were also shown the scientific instrument factory, where, under the guidance of the director (Mr. E. F. Campbell), Mr. Brocker and Mr. D. R. Chapman, they saw the laboratory furniture, balances, centrifuges, and other scientific instruments being manufactured, assembled, and tested.

Chlorination of Methane

U.S. Reports on Two I.G.F. Processes

TWO reports on German developed processes for the chlorination of methane, prepared by American investigators who visited Germany, have just been made available by the Office of Technical Services, of the U.S. Department of Commerce.

The first report, dealing with the manufacture of methane chlorination products at the I. G. Farbenindustrie plant, Hoechst, Germany, summarises the process as follows:—

Illuminating gas is processed to substantially pure methane and is reacted with electrolytic chlorine. The resulting mixture of methyl chloride, methylene chloride, chloroform, and carbon tetrachloride is collected and separated by fractional condensation and subsequent distillation. Part of the methyl chloride is recycled.

The report describes in detail the starting material, chlorination kiln, air cooler, hydrochloric acid absorption, neutralising, washing, compression, refrigeration, precooling, pressure distillation, and other relevant steps in the process. It also discusses storage and shipment technique and a bibliography and flowsheets are appended. The report, PB-86483, "The Manufacture of Methane Chlorination Products in I. G. Hoechst Plant," amounts to 34 mimeographed pages, costing $1.

Carbon Tetrachloride

The second report contains data on the equipment and process used to make carbon tetrachloride by the chlorination of methane at the I. G. Farbenindustrie plant at Huls. This plant was the only one known in Germany where the process was used.

The equipment is essentially a hydrochloric acid plant which was partially converted after the war to make carbon tetrachloride. The process is stated to consist of a two-stage burning of methane with chlorine. The excess chlorine in the first stage acts as a diluent while the hydrogen chloride gas formed by the first stage burner acts as a diluent in the second stage burner. The process is reported to act smoothly and without difficulty.

The five page report, No. PB-80400, "High Temperature Chlorination of Methane at Huls" (25 cents), is confined to a brief description of the starting materials, operation of the process, and the equipment used.

Parcels for Germany.—Subject to export licence regulations, parcels up to 22 lb. in weight may now be accepted for the British and American zones of Germany (excluding Berlin).

Overhauling the Factories Act

Some Provisions of the New Bill

PARLIAMENT has included in its heavy programme a Factories Bill designed to amend the 1937 Act and bring it up to date. It is not surprising that the experience of ten years has suggested the need for amendment.

Every accident which ends fatally, or causes more than three days' incapacity, must be reported. The Factory Inspector attends the inquests; he considers all reports with an eye to exposing and prosecuting any breach of the Act or Regulations. At the same time trade union solicitors will probably be considering whether a claim for damages can be made on the ground that the employer has neglected some duty imposed by the Act. And, as types of machinery are evolved which were not in general use in 1937, new protective regulations have to be considered.

The new Bill, however, does not propose drastic changes. The principles laid down by the 1937 Act remain; but there are to be a number of alterations in procedure. It will be necessary for managers and welfare officers in chemical factories to familiarise themselves with the many changes contained in the Bill's 16 clauses.

The 1937 Act requires a person to give notice to the Factory Inspector within one month of occupying a factory or of installing mechanical power. The Bill requires this notice to be given one month *before* occupation or before the installation of mechanical power.

Risk of Bodily Injury

Section 40 of the 1937 Act gives a court of summary jurisdiction power to prohibit the use of a factory if it is " in such a condition that any process or work carried on therein cannot be so carried on without risk of bodily injury "; the prohibition will continue until " such works have been executed as are in the opinion of the court necessary to remove the danger." This section has been tightened up. It is to apply where the factory is so " constructed or placed " that there is danger; whereas the court might previously make an order as to the condition of the factory only, it will now be able to object to the site, or the construction as a whole, and close down the factory. It will apply not only to work actually being carried on, but to work intended to be carried on in the future.

For the phrase " without risk of bodily injury " there has been substituted the much wider phrase " with due regard to the safety, health and welfare of the persons employed." Under section 40, the court had to set out the works which it considered to be necessary before a factory could be reopened; the amending Bill will enable a court to close a factory without such conditions. It will be open to the owner or occupier to apply to have such an order revoked.

The 1937 Act requires every hoistway or liftway to be fitted with gates. An amendment provides that where the hoist or lift is not connected with mechanical power, the gate must be kept closed and fastened, except when the cage or platform is at rest at the landing.

Toxic Atmospheres

The precautions to be taken where work is done in places where dangerous fumes are liable to be present have been made more stringent. It is proposed to insert a provision that " a person shall not enter or remain in any chamber, tank, vat, pit, pipe, flue or similar confined space for any purpose unless either—

(a) he is ensured of a supply of air adequate for respiration and to render harmless any fumes; or

(b) he is wearing a suitable breathing apparatus."

The breathing, reviving and rescue apparatus which are required by the principal Act will, under the new provisions, have to be thoroughly examined " by a competent person " once a month, and he must make a report on them, giving certain prescribed particulars

An alteration is to be made in the provisions as to periodical examination of gasholders. Where a lift used in connection with a gasholder has been in operation for more than 20 years, it must be examined at least once every ten years. Where it has been in use for more than 28 years on July 1, 1948, it must be examined within two years. A competent person must examine the internal state of the sheeting by cutting samples from the crown and sides of the holder.

The Secretary of State has power to make regulations where any " manufacture, machinery, plant, process or description " causes risk of bodily injury. This is to be extended by the addition of the words " equipment " and " appliance." Regulations may at present only deal with persons employed in connection with the machinery, but in future they will apply to all persons employed in the factory.

The provisions already in force as to medical supervision of young persons under 16 are now to apply to young persons up to

their eighteenth birthday. They must be examined at least once every 12 months.

By virtue of section 11, the Secretary of State has power to make regulations as to medical supervision in certain limited cases where there is a serious risk to health This is to be considerably extended to cover all cases where it appears that there may be risk of injury to health from any substance or material brought to the factory to be used or handled there or from any change in the conditions of work or other conditions in the factory.

In dealing with temperature in workrooms and ventilation, lighting, sanitary conveniences, washing facilities and accommodation for clothing, the 1937 Act provides that they must be sufficient or effective or suitable and gives the Minister power to issue regulations establishing a standard. For example, ventilation must be "effective and suitable" and the Minister may "prescribe a standard of adequate ventilation."

Doubt has often existed as to whether a factory owner who observes the standard automatically carries out the obligation to provide what is effective and suitable. An amendment provides that the regulations may or may not make conformity to the standard a sufficient compliance with the Act. Provided that the regulations state clearly whether they are doing so or not, the position will be much clearer in the future.

The original Act required sitting facilities to be provided for female workers, who work standing, so that they may take advantage of opportunities for resting. For this there is to be substituted an obligation to provide sitting facilities for all employees where they have "reasonable opportunities for sitting without detriment to their work." The seat must be "of a design, construction and dimensions suitable" for the employee and the work; it must be provided with a foot rest if there is not comfortable support for the feet; the seat must be adequately and properly supported.

Preliminary Training at National Foundry College

THE new session of the National Foundry College will begin at the Technical College, Wolverhampton, on September 27, 1948, and intending applicants should apply to the head of the college, Mr. J. Bamford, B.Sc., for forms of admission.

Candidates with suitable practical experience and technical knowledge will be admitted direct to the full-time diploma course, which will end in July, 1949. A minimum of one year's practical experience is required in the founding industry, together with an appropriate university degree, or Higher National Certificate, coupled in the case of the latter with a record of additional study, special responsibility or informative industrial experience.

More Preparation Needed

The college states that experience has shown that some candidates require more preparation, particularly where the major technical colleges are not readily accessible to them. For these a preliminary course, of six months' duration, to be called Part 1 of the diploma course, will be arranged to begin in January, 1949. The present diploma course will become Part 2, and the intervening period between the end of Part 1 in June, 1949, and the beginning of Part 2 in the following September, can be spent in acquiring foundry experience. It will not be essential for students to take Part 2 immediately following Part 1, and possibly 18 months may elapse between the two sections of the course.

Candidates who are in doubt as to which part of the course their experience and qualifications entitle them to register are advised to apply to the head of the college, who will recommend the most suitable course.

The fee for Part 1 is £40 for the session and for Part 2 is £60. The board of governors may remit fees for all those candidates whose employers belong to a trade association giving financial and other support to the college.

It is hoped that a hostel will be available in September, 1949, or as soon as possible thereafter, for students of the college registering for the new session.

U.S. Dyestuffs Order.—Over 1.5 million dollars is stated to be the value of the contract for dyestuffs reported to have been placed recently by The World Commerce Corporation, of New York, U.S.A., with Farbenwerke Casella, of Mainkur and Fechenheim, both near Frankfurt a/M. The machinery and basic products required for the manufacture of the dyestuffs—which are to be provided by the U.S. concern—are estimated to be of a value of $500,000.

HIGH STRENGTH HYDROGEN PEROXIDE

Persulphate Production for Power Uses

by V. W. SLATER and W. S. WOOD*

THE use of solid fuels for rocket propulsion dates back at least to the thirteenth century when charcoal and sulphur were the fuels with saltpetre as the oxidant. It is only during the last 25 years that liquid fuels have been introduced, and it is this development which has enabled really large-scale rockets to be used and to reach the stratosphere. Some of the liquid fuels are petrol, alcohol and hydrazine hydrate, and among the oxidants are liquid oxygen, nitric acid and hydrogen peroxide.

The use of hydrogen peroxide for propulsion purposes is a comparatively recent development, as is shown by the fact that one of the original references is in 1934, in an American journal, *Astronautics*, where Harry Bull mentions the use of 30 per cent hydrogen peroxide, 30 per cent being the normal commercial product. Other references to what we may now describe as the same low strength hydrogen peroxide appear in two patents taken out during October, 1939, by Alf Lysholm, of Stockholm[1] (U.S.P. 2,325,618 and U.S.P. 2,325,619).

According to these patent specifications, a supply of oxygen is obtained by passing a 30-40 per cent solution of hydrogen peroxide through a coil in the chamber in which the fuel is burnt. The heating of the hydrogen peroxide in the coil is claimed to cause its decomposition, so that the oxygen thereby liberated may be used to burn the fuel in the rocket propulsion unit.

Early Development in Germany

Prior to World War I, most of the hydrogen peroxide produced contained 6 per cent or less hydrogen peroxide by weight, but between the two world wars the commercial production was essentially of 30-35 per cent solution. Higher strengths were not then available, and this no doubt explains why the above references were limited to the 30-40 per cent product.

In the years immediately before World War II, experimental work was carried out both in this country and in Germany on the production of higher strengths of hydrogen peroxide, *e.g.*, 80-90 per cent, but in Great Britain there were no commercial or military developments to encourage large-scale production. It is now known that in 1934 the Germans started experimenting with higher strength solutions of hydrogen peroxide for power units, and progressively increased the concentration of the solution until they actually put into practical operation the use of 80-85 per cent hydrogen peroxide for various military purposes.

Power Applications

Before discussing hydrogen peroxide, as such, it may be useful to summarise the methods of application of hydrogen peroxide in power units. Its value for this purpose depends upon the considerable quantity of heat and oxygen generated by the decomposition of the hydrogen peroxide and by the fact that this decomposition may be fairly readily controlled. The methods of application may be divided into the following three main groups :—

(a) The first is by decomposition to give steam and oxygen for power, by spraying hydrogen peroxide and a catalyst solution (*e.g.*, sodium or calcium permanganate) through separate jets into a reaction chamber. This method of obtaining power from hydrogen peroxide was used for propelling the glider bomb, Hs 293, for assisted take-off units for launching heavy aircraft, for working the turbine of the long-range rocket (V.2) and for catapult launching of the flying bomb.

(b) The second method of use depends upon the release of the oxygen for burning fuel for an engine. In this case the hydrogen peroxide is decomposed by a solid catalyst, the oxygen and steam from the decomposition chamber passing to the engine where the oxygen effects the combustion of a fuel.

(c) The third employs the hydrogen peroxide as an oxidant for direct burning of a fuel. In this case, the hydrogen peroxide is made to react directly with another liquid, such as hydrazine hydrate or an amine.

Solutions containing 85 per cent hydrogen peroxide are not explosive, but a mixture of this strength with certain organic substances gives a product which is equal to some of the most powerful explosives known.

General Properties

Hydrogen peroxide has been an article of commerce for over 50 years. In the early days a 3 per cent or 10 volumes solution, or less frequently, a 6 per cent or 20 volumes solution was supplied. Indeed, these strengths are still those normally supplied in the shops for pharmaceutical or cosmetic purposes.

* Abstract from a paper read before the British Interplanetary Society (*Journal of the British Interplanetary Society*, 7, 4; July 1948).

To-day, the manufacturer sells hydrogen peroxide mainly of 27.5 per cent to 35 per cent strength, leaving it to the user to adjust the strength to his requirement by simple dilution with water. A word of warning here is not out of place, since, if the diluted product is to be stored for any length of time, special precautions are required during the dilution, particularly as regards the purity of the water used, otherwise the final product may be unstable.

The lower strength solutions were often supplied in wooden barrels, but for many years all strengths have been packed in glass carboys fitted with a suitable closure. The present tendency is to replace the glass carboys with aluminium tanks or drums.

High Margin of Safety

Solutions of up to 35 per cent strength can be handled quite safety, although if spilt on the clothes it is likely that all the colour will be discharged or modified. The solutions also cause temporary irritation of the skin which follows from the formation of a patch of small white "blisters." The effect, however, passes off within the half-hour.

The product as sold is normally so stable that it can be relied upon to maintain its strength for at least a year under normal conditions. The product may be boiled for some hours with only a small percentage decomposition; indeed some qualities are supplied which show no decomposition on 3 hours boiling. It is important to avoid contamination of the solution since this may promote decomposition. Less stable qualities are sold for special commercial purposes.

The quality of hydrogen peroxide manufactured did not always possess such excellent stability and the uncertainty of the stability of the earlier product created many doubts as to the possibility of making and storing higher strength solutions. The rapid progress made during the past 20 years in the stability field has helped to encourage the manufacture of the higher strength product and, as a result, high strength hydrogen peroxide solutions of the same reliable stability as the lower strength solutions are now manufactured.

The presence of catalysts such as iron or copper will cause rapid decomposition of 30 per cent hydrogen peroxide. There is no explosion, but if the rate of decomposition is sufficiently rapid the temperature of the peroxide may almost reach boiling-point. Thus, in a simple experiment in a beaker, the addition of 0.5 gr. permanganate crystals to 100 ml. 30 per cent hydrogen peroxide, *i.e.*, sufficient to decompose the peroxide completely, raised the temperature to 95°C. in less than 1 sec.; the peroxide was completely decomposed in 4 sec. There were then 65 ml. of solution left, *i.e.*, 41 per cent by weight of the original hydrogen peroxide solution had decomposed and vaporised into oxygen and water vapour, 59 per cent being left as water.

With solutions of up to 40 per cent concentration there is no immediate fire risk, but of course, if a fire does occur the heat and foreign matter will promote rapid decomposition of the hydrogen peroxide, and the oxygen so liberated will support the combustion. Continual soaking of organic materials, however, may promote a fire risk, but this is not usual.

Until 1908, hydrogen peroxide was produced solely by the reaction between barium peroxide and sulphuric acid in the presence of a solvent acid. The barium peroxide was made by the Brin process, based on the absorption of oxygen from the air in barium monoxide at temperature of 500-550°C.

The hydrogen peroxide obtained was of not more than 6 per cent strength, but in about 1922, distillation equipment was introduced which enabled 35 per cent hydrogen peroxide to be made from the 6 per cent solution, and there is little doubt that the same solution could be converted to 90 per cent.

Although the barium peroxide process is still operated, it is not so self-contained as the electrolytic persulphate processes, and therefore it is not surprising to find that all recent development and increase in production has been based on the latter.

Solid and Liquid Processes

Broadly speaking, the persulphate processes can be divided into two groups, one based on the production of a solid persulphate and the other based on the use of a persulphate or persulphuric acid solution. In all cases the persulphate, solid or in solution, is heated in the presence of sulphuric acid to give hydrogen peroxide vapour which is then fractionated to give 30-35 per cent solution.

The solid persulphate process was commercialised in 1909 by Pietzsch and Adolph and during World War II the Germans erected huge plants to operate this process. The decision to use this process was no doubt influenced by the personal interest of Dr. Pietzsch who, in addition to producing hydrogen peroxide, was interested in its application for war purposes and was a personal friend of Hitler.

The first completely liquid process was introduced as early as 1908 in Austria. This used persulphuric acid, but later ammonium persulphate solution was used and this latter has found extensive application. The completely liquid process eliminates the costly

and cumbersome separation of a solid persulphate and allows for more continuous operation. The process developed and operated by Laporte Chemicals[3] in this and several other countries is based on ammonium persulphate.

As normally operated, the persulphate processes give solutions of 30-40 per cent hydrogen peroxide, although it is possible by a comparatively simple modification to increase the strength to 50-60 per cent.

Since the solutions employed in the electrolysis are highly acid, slight traces of acid are carried over with the vapour drying the distillation part of the process and are condensed into the hydrogen peroxide solution. These traces of acid are not of any great consequence in the lower strengths of hydrogen peroxide, *i.e.*, up to 50 per cent, but they are detrimental in the higher strength solutions by adversely affecting the stability and corrosive properties of the solution.

For this reason, in the manufacture of high strength solutions, it is necessary to include a purification stage, the ultimate product being of very high purity, similar to that of an analytical reagent, and of a high order of stability.

German Industry

The German process for 30-40 per cent hydrogen peroxide was originally developed and worked by the firm of Elektrochemische Werke at Hollriegelskreuth, near Munich, about 1909. This same firm developed a process for the higher strength material, starting about 1934, when they first produced 60 per cent and later 80-85 per cent. However, the process of manufacture must have been considered somewhat dangerous since they were nervous of producing strengths greater than 80-85 per cent.

Although a fair quantity of the high strength material was produced at Munich, it was soon evident that much larger quantities would be required for military purposes, and for this reason a large factory was built at Bad Lauterberg in the Harz mountains, but was only in full production during the latter part of the war. A still larger factory was being built at Rhumspringe some 11 miles away, but this factory was never put into production. The Bad Lauterberg factory was extremely well sited and suffered no damage, either by Allied bombers or by military operations. There are several published technical reports[4] which have been made by British and American investigators and which deal in great detail with the method employed.

The German process comprises three main operations which are :—

(a) Electrolysis of sulphate to persulphate.

(b) Precipitation of potassium persulphate.

(c) Distillation of potassium persulphate with sulphuric acid to produce hydrogen peroxide.

There are, in addition, ancillary purification processes for the liquors and, of course, the concentration to the higher strength.

The electrolysis plant consists of large stoneware baths fitted with carbon rod cathodes, platinum wire anodes and cooling tubes. The baths are connected electrically in series and each bath operates at approximately 6000 amps.

A solution of ammonium sulphate in sulphuric acid and containing some potassium sulphate is run continuously through a series of baths with the resulting formation of persulphate.

The solution, after electrolysis, is then treated with potassium sulphate in special reaction tanks and the precipitated potassium sulphate is filtered through a centrifuge ready for the distillation part of the process.

The distillation plant consists of a stoneware boiler attached to a short stoneware column separator. This is specially designed to retain the acid spray. The separator is connected to a packed stoneware column some 4 metres high and 1 metre diameter, which is, in turn, attached to suitable condensing and vacuum equipment.

The potassium persulphate crystals are placed in the retort, treated with sulphuric acid, and steam is blown into the mixture. The reaction produces hydrogen peroxide vapour, which passes through the separator into the fractionating column where the hydrogen peroxide is condensed by direct introduction of small quantities of water, while the remaining water vapour is condensed and collected for return to the cycle. The whole operation is carried out at a pressure of some 40 mm. of mercury. The 30-35 per cent hydrogen peroxide so obtained is then ready for the purification and concentration plant.

The Laporte Process

The process operated by Laporte Chemicals consists of two steps (a) electrolysis and (b) distillation. The electrolyte is a solution of ammonium sulphate and sulphuric acid, and contains no potassium salts. The electrolysis is carried out to give higher concentrations of persulphate and no precipitation process is employed. The acid ammonium persulphate solution is evaporated in a tube evaporator. The concentrated liquor then flows down a packed tower in which the persulphate is converted to hydrogen peroxide, which is removed as vapour. The hydrogen peroxide vapour is then fraction-

ated to give hydrogen peroxide of 27.5-35 per cent strength and, in fact, 50 per cent material may be obtained at this stage.

Alternative Processes

For a product which played such an important part in the German war effort it was to be expected that alternative methods of production would be investigated. Although considerable work was carried out, no corresponding large-scale unit was operated to manufacture hydrogen peroxide.

Before the war, a number of patents had been taken out for the direct production of hydrogen peroxide from hydrogen and oxygen (or air), but as far as is known none of them was operated on a commercial scale. The Germans continued their work on the synthetic process at Munich[5] and erected a small-scale pilot plant, but the results were uneconomic compared with the persulphate process.

The other process investigated was the so-called autoxidation process which is based on the alternate oxidation and reduction of certain organic compounds. Patents based on this method had been taken out both in the United States and in Germany before the war; the Americans used, for example, aromatic azo compounds while the Germans developed the use of 2-ethylanthraquinone.

The work was continued in Germany during the war at the I. G. Works, Oppau[6], and a small-scale pilot plant was operated. This type of process is, however, not without hazard, due to the possible formation of dangerous organic peroxy compounds and ignition of inflammable solvents.

Both the German and British processes for producing high strength material from 30-35 per cent solutions include purification and concentration operations. The main difference in the two processes is in the design of the evaporators used. The plants are similar in that they include a mist separator and a packed tower for fractionation with connections to suitable condensing and vacuum equipment.

The German plant resembled in some respects the persulphate distillation unit previously described. The evaporation and final concentration were carried out in large stoneware retorts fitted with a highly polished steam-heated coil made of Krupp V.14A stainless austenitic steel.

In the purification stage the 35 per cent product was fed into the retort wherein it was evaporated, the volume being kept constant by a continuous supply of fresh 35 per cent solution. The vapours were passed through a separator to a packed column where they were fractionated to give a pure 60-70 per cent hydrogen peroxide solution. This higher strength material was then fed continuously to another similar unit wherein it was concentrated in the retort to the 80-85 per cent product.

(To be continued)

REFERENCES

[1] *U.S.P.* 2,325, 618 and 2,325, 619.
[2] *B.P.* 23, 158/1910.
[3] *B.P.* 390, 549.
[4] *BIOS* Nos. 294 and 599; *CIOS* Nos. xxiii-18, and 42.
[5] *CIOS* No. xxiii-44.
[6] *CIOS* No. xix-4.

U.S. CHEMICAL PROFITS INCREASED

COMPARISON of the prewar and postwar rates of return on stockholders' investments for more than 500 identical manufacturing corporations in the United States shows that the rate of return, after taxes, in 1947 for industrial chemicals, including rayon, was 17.7 per cent against 13.8 per cent in 1940. This is according to a study just completed by the United States Federal Trade Commission, which covers the years 1940 and 1947 and includes 25 selected manufacturing industries, most of which are among the nation's largest and most concentrated industrial fields.

No industries are included in the study unless the total assets of corporations reporting both years represented in 1940 more than 50 per cent of the total assets of the industry as a whole. Rates of return were computed of the average investment as of the beginning and end of each year. The stockholders' investment consisted of the capital stock outstanding, paid-in or other capital surplus, earned surplus, minority interest in capital stock and surplus, and surplus reserves, less reported appreciation. The net income represents the profit after deducting federal income taxes. The following table shows the rates of return for the chemical and allied industries:—

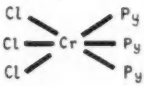
Industry	No. of Corporations	Rate of return after taxes (per cent) 1940	1947
Industrial chemicals (including rayon)	37	13.8	17.7
Industrial chemicals	30	14.4	17.6
Rayons	7	8.6	18.4
Primary smelting and refining non-ferrous metals	18	9.1	14.9
Blast furnaces, steel works, rolling mills	34	8.1	11.0
Petroleum refining	41	6.8	14.0
Tin cans and other tinware ...	6	9.4	10.3
Abrasives, asbestos and miscellaneous non-metallic mineral products	16	13.9	15.6

ORGANIC REAGENTS IN INORGANIC ANALYSIS

Some Theoretical Considerations

From a Special Correspondent

ACCORDING to the electronic view, at least two important types of compound may be formed between an inorganic and an organic substance. First of all reaction may produce a simple addition compound. The organic molecule may add on to an inorganic salt, for example, as when pyridine is added to chromic chloride :—

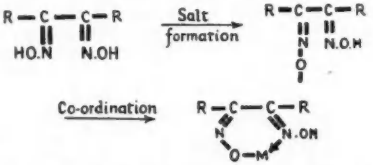


Frequently the resulting compound no longer is ionised even if the inorganic compound was a strong electrolyte. An alternative mode for the reaction is for the addition to take place between the organic molecule and an ion of the inorganic salt. This phenomenon is, of course, by no means confined to reaction with organic materials, since we are familiar with exactly the same procedure in the addition of ammonia to copper sulphate.

This really is addition of the ammonia to the copper ion, to form $Cu(NH_3)_4$++ ions; the sulphate ions are unaffected. Again, the formation of cobaltinitrites may be regarded as arising by a similar mechanism.

Chelate Compounds

For the analytical chemist, by far the most important group of products from inorganic-organic reactions is that comprising the compounds known as inner complex compounds, chelate compounds, or chelation compounds. In the general example, it will be seen that the first step is the formation of a salt, through the replacement of a hydrogen by means of a metal ion :—



The metal ion then proceeds to co-ordinate with another part of the organic molecule, so that a ring structure is formed. These ring structures are of the highest importance to the analytical chemist, and require further consideration.

It is found, on examination of the structures of inner complex compounds, that the rings most usually formed contain five or six members. It is easy to reason, remembering the stability of similar structures in organic chemistry, that such complexes will show increased stability.

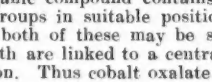
In actual fact, considerable systematic examination of such complexes has shown that the ring structure has a number of effects on the properties of the product. As anticipated, the stability is often very great. Hence the complexes can be put through the procedures required of them in analytical chemistry without breaking down.

Better Analytical Properties

In the second place, the power bond formation is saturated, so that the complexes show a lower tendency to hydration than might be expected. Hand in hand with this, there is a lowered solubility. It is clear that in most cases this will once again produce desirable analytical properties.

Again, the ring structure is often associated with an increase in visible colour, once again an important factor in the production of a satisfactory end product. Consequently, any compounds which will permit of the formation of ring structures with inorganic ions are worth investigation from the aspect of their probable use as analytical reagents.

Surveying ring structures as a whole, it is found that three possible types may arise. If the organic compound contains two salt-forming groups in suitable positions in the molecule, both of these may be substituted so that both are linked to a central metallic atom or ion. Thus cobalt oxalate is formed by the linking of cobalt to three oxalate ions, each of the two acidic groups in the oxalate playing its part in the final molecule :—



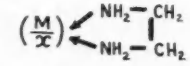
A very wide range of organic groupings shows this mode of reaction. Some which may be mentioned as the more important are the carboxyl group, —COOH, as in the example already quoted; the sulphonic

group, —SO_3H; the hydroxyl group, —OH; the mercapto group, —SH; the oxime group, =NOH; the amine group, $-NH_2$; the imine group, =NH; the nitroxyl group, —NO.OH; the arsinic group, $-As(OH)_2$; and the arsonic group, $-AsO(OH)_2$.

The second type, and probably the most numerous, is formed in the manner indicated by the general example already quoted. Complexes in this class are, in other words, produced by reaction with an organic compound containing both a salt-forming group and a group with which it is possible to form a co-ordinate link.

The atoms which are most likely to form co-ordinate links are the oxygen of the carbonyl group, =CO, and of the hydroxyl group, —OH, the nitrogen of the amino group, $-NH_2$, of the nitro group, $-NO_2$ of the nitroso group, —NO, of the imino group, =NH, and of the oxime group, —NOH; and the sulphur of the thiocarbonyl group, =CS. Many of the examples to be quoted later in this article will be seen to belong to this class.

The third possibility is that two co-ordinating groups in suitable positions will join up with the metal ion, as in the reaction between many metals and ethylenediamine:—



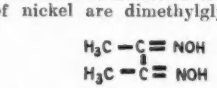
Thus it can be seen, since a number of groups can either be salt-forming or co-ordinating, that there is no *a priori* reasoning, if, for example, a compound contains two oxime groups, as to which class of compound will be formed, since all three are possible.

Much of the early investigation of organic reagents was completely haphazard. It is only comparatively recently that any systematic investigation has been carried out in connection with these reagents and reactions. In spite of this, although much work remains to be done, a considerable body of systematic knowledge has been acquired in this field.

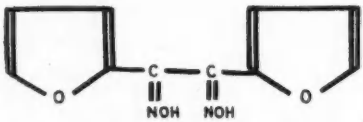
Sensitive Groupings

The first important generalisation which is possible is that certain organic groupings are more or less sensitive to particular inorganic ions. Thus, the α-dioximes containing the grouping:—

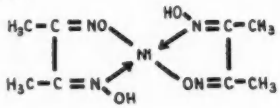
are sensitive to nickel, and it may be assumed that any organic compound containing this grouping has quite a high chance of proving to be a reagent for nickel. Two particularly useful reagents in constant use for the detection and determination of nickel are dimethylglyoxime:—



and α-furil dioxime:—



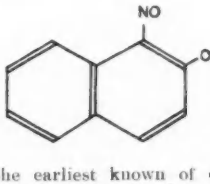
Both of these, as can be seen from the formulae:—



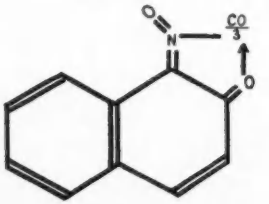
contain the α-dioxime grouping. Two molecules of the organic compound form a complex with the central nickel atom, producing two chelate rings each containing five members.

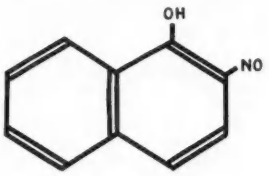
The grouping —C =C— is sensitive for

cobalt. The compound α-nitroso-β-naphthol:—

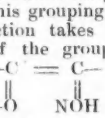


one of the earliest known of organic reagents, contains this grouping, three molecules of the organic compound complexing with one central cobalt atom:—

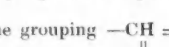




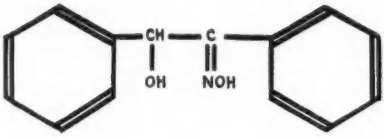
Since the compound β-nitroso-α-naphthol also contains precisely the same group, it is also found to be satisfactory as a reagent for cobalt. In this grouping, it is probable that before reaction takes place there is rearrangement of the group to the form



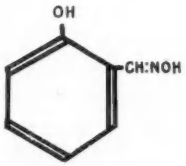
the oxygen of what was formerly the hydroxyl group then providing the co-ordinate link, while the salt-formation arises from the newly produced pseudo-oxime grouping.

For copper the grouping 

often found to be sensitive, and two examples of well-known reagents for copper which contain this grouping are α—benzoin oxime :—

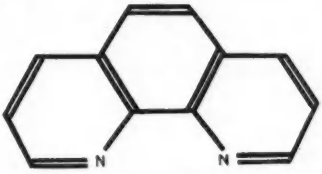


And salicylaldoxime :—



Finally, the —N—C—C—N— grouping is sensitive for the ferrous ion, and the reagents α : α' dipyridyl :—

And *o*-phenanthroline :—



Both possess this grouping.

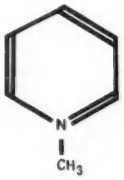
Increase of Molecular Weight

It has already been mentioned that it is to be anticipated that compounds with a sensitive grouping will prove to be satisfactory reagents. However, it may be that the complex produced has not got a sufficiently low solubility to make its use practicable.

A second generalisation has been deduced in this connection, to the effect that increase in the molecular weight of the complex will probably lower its solubility, so that it may be possible to prepare a compound which is more effective as a reagent by adding on heavy organic groupings at suitable points in the organic molecule.

This molecular weight effect can be seen from the fact that the increase in molecular weight from dimethylglyoxime to α-furil dioxime, caused by the insertion of two heterocyclic rings, induces an increase in the effectiveness of the reagent by a factor of about three.

Again, while α-picoline :—



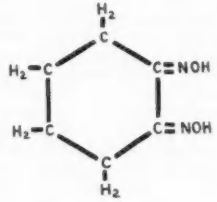
can be used as a reagent for bismuth, α-napthoquinaldine :—

is 150 times as sensitive. This increase

in sensitivity, produced by decreasing the solubility of the complex, is somewhat complicated by the fact that often an increase in the molecular weight of the reagent will also lower its solubility.

It is clear that it is useless to strive after decreased solubility for the complex if it is not possible to get sufficient of the reagent into solution to cause precipitation of all the ion involved. On occasion, a suitable change in structure of the organic compound, coupled with increase in molecular weight, will provide the answer.

While dimethylglyoxime is a sensitive reagent for nickel, it is not water-soluble, and must be used in alcohol solution. This may at times prove troublesome. But the compound *o*-cyclohexane dione dioxime :—



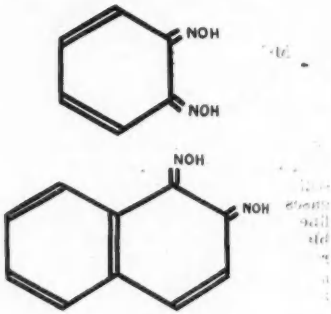
is rather more sensitive than dimethylglyoxime, and has the added advantage that it is water-soluble.

Change of Structure

Small changes in structure are known, however, to have a marked effect on the properties of organic compounds, and it is sometimes found that such changes will completely destroy the sensitivity of a particular grouping for a metallic ion.

A simple instance of the way in which organic compounds are affected by structure can be found by comparing ethanol, $C_2H_5.OH$ with the corresponding sulphur compound, $C_2H_5.SH$. While the former is completely miscible with water in all proportions, and may thus be said to have infinite solubility, the latter is only very slightly soluble in water.

Behaviour which may be assumed to arise from similar causes occurs frequently when one investigates all compounds which should, at first sight, be sensitive for one particular ion. Turning once more to the nickel-sensitive grouping for examples of this, it will be recalled that we have already quoted dimethylglyoxime, α-furil dioxime and *o*-cyclohexane dione dioxime as satisfactory reagents. At first sight, there seems no reason to suppose that the two compounds shown below :—



could not be equally effective. Yet neither of them is found to be of the slightest use as a reagent for nickel.

It has been suggested that the introduction of the ethylenic linkages near the oxime groups may permit an electronic rearrangement which removes the lone pair of electrons from the nitrogen atom, thus preventing it from co-ordinating.

We can see, in summing up, that many organic groupings are known to have analytical possibilities for inorganic ions. These groupings can be affected in their behavious by alterations in the general structure of the organic molecule. Thus the effects operating in the formation of complexes may be divided broadly into two types, group effects, and the effect of the molecules as a whole on the behaviour of the groups.

(Further articles on this theme will appear shortly.)

No Substitute for Linseed ?

The Scottish floorcoverings industry has been unable to find a satisfactory substitute for linseed oil in the manufacture of linoleum, stated a Kirkcaldy manufacturer last week. This confirms earlier reports that efforts to use sardine oil and synthetics had proved less successful than had been hoped. These substitutes, it is stated, do not impart to the floorcloth the fluidity and consistent wearing qualities, under varying temperatures, which linseed does. For this reason the linoleum industry is pressing for a bigger allocation of oil. Complaints have been made that the paint industry is receiving practically 100 per cent of its pre-war requirements of linseed, while linoleum manufacturers, who were limited to 30 per cent, are still only receiving 58 per cent of pre-war usage.

AGGLOMERATION OF AEROSOLS

Increasing Industrial Uses of Ultrasonics

AMONG the many and increasing industrial applications of ultrasonics, that of agglomerating and recovering industrial wastes is of particular interest. Despite the attention given to such recovery in recent years there remains much scope here.

In many industries valuable materials are still lost because they are carried off in flue gases or other gas streams in the form of finely divided particles, *e.g.*, in the carbon black, soap manufacture, and petroleum-refining industries. Natural fog is itself an aerosol which, from the point of view of air navigation, should be dispersed or agglomerated by every possible means, ultrasonic or otherwise.

In their English patent application No. 20638/1947 (open to public inspection), the Ultrasonic Corporation of Cambridge, Mass., U.S.A. (Conv. date September 12, 1946) claim some important improvements in the methods hitherto used, based on certain fundamental discoveries. In the first place, for any given aerosol there is an optimum frequency at which sound waves will accomplish rapid agglomeration, and at other frequencies there will be little or no effect. For each aerosol there is a minimum amplitude or sound intensity.

Particles are usually subject to Brownian movement, and, when agglomerated, also to gravity. From these factors it is possible to calculate the normal collision expectancy rate. Agglomeration is brought about by increasing this collision expectancy, as may be illustrated with water. Particle size is another important factor.

From these and other theoretical considerations a process has been devised for subjecting aerosols to sound waves of such intensity and frequency as to cause differential particle velocities among the particles substantially greater than those resulting from Brownian movement and free fall effect. These various factors are calculated for a given case, and after establishing maximum differentials the frequency may be varied, *e.g.*, downward under specified conditions.

The method includes the introduction of a second aerosol of different particle size and subjecting the mixture to action of sound waves of optimum frequency. Among suitable admixtures is water vapour or wetting agent, to make particles more adhesive and increase particle size, so that the range of mass/drag ratios of particles is increased. It is further increased by maintaining in the aerosol or mixture or restoring to it a certain proportion of agglomerated particles. Thus also collision expectancy is augmented.

It is necessary in any case that the frequency of the sound waves shall be maintained at about the optimum for the range of mass/drag ratios of particles in the case of mixtures, although with the original aerosol the frequency may be below the optimum, under certain conditions.

Various other factors may be introduced: heating may increase adhesiveness; passage through an electrostatic field may produce random ionisation before or simultaneously with supersonic treatment; ultra-violet or X-ray radiation, reduction in temperature, or increased pressure to reduce evaporation, may also have important effects.

New Low-Temperature Acid Recovery Process

DEVELOPED first during the war, and perfected since, The Monsanto Chemical Company has a new flexible, low-temperature process for sludge acid recovery which produces a gas higher in sulphur dioxide content than is obtainable by burning pure sulphur. It is being successfully employed by the company at St. Louis, Missouri.

Known as the Monsanto-Ross-Wilde process, the new continuous process is said to be sufficiently flexible to operate efficiently on any strength refinery acid waste fluid which can be pumped, according to T. R. Harney, manager of Monsanto's engineering sales department.

Hitherto, the varying chemical and physical characteristics of sludge acid have made its disposal one of the major problems of the petroleum industry, and burning or dumping such sludge has created serious air and stream pollution problems.

Recorded over long periods of operation, the process yields over 98 per cent of the recoverable sulphuric acid of the sludge feed. Gas leaving the decomposer unit shows a strength of 70 to 90 per cent sulphur dioxide. It is particularly suited for use in connection with the production of sulphuric acid by the contact process, and for the production of liquid sulphur dioxide.

Air and Gas Dryer

British and U.S. Production

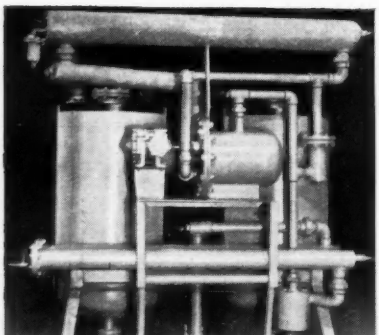
PRODUCTION of a new range of equipment primarily designed for drying instrument air, and built in accordance with ASME Code requirements, has been started by the Pittsburgh Lectrodryer Corporation, Pittsburgh, Pa., and production is also being undertaken in this country. The new equipment is fully automatic, making possible the reactivation, cooling and reversal of the machine's dual adsorber towers without manual attention. It will require considerably less space than that occupied by manually-operated dual adsorbers of comparable capacity.

Two Moving Parts

The instrument air dryers will be built generally for operation on pressures up to 150 p.s.i. and will employ either steam or electric reactivation. There will also be a wide range of standard sizes up to 5000 standard c.f.m. and larger sizes are to be produced. In all of them the only moving parts will be the reactivating pump and valve reversing mechanism.

Like other Lectrodryer machines, these dryers remove moisture from air and gases by means of solid adsorption. Activated alumina is used as the drying agent.

In England these air and gas dryers are built by the company's licensees Birlec, Ltd., Tyburn Road, Erdington, Birmingham.



The new air and gas drying equipment, the " BY " Lectrodryer, which employs solid adsorption using activated alumina

New Spanish Group

Activity in Nitrogen and Plastics

WITH the assistance of leading banks, a new group, with a capital of 60 million pesetas, has been formed in the Spanish chemical industry. It includes the Altos Hornos de Vizcaya, Soc. Españ. de Fabricaciones Nitrogenadas (SEFANITRO), Nitratos de Castilla (NICAS), Union Quimica del Norte de España (UNQUINESA), the Babco de Bilbao, and Banco de Vizcaya. It thus represents mainly the nitrogen industry. Other firms in this branch of chemical industry and in some other branches are likely to join the organisation.

There are further evidences of the increasing vitality of chemical industry in the country in the number of substantial enterprises which have been registered in recent months, several of them associated with plastics. Registrations in Barcelona include: Juan Burgos Roca, which intends to produce some 50 kilogrammes of synthetic resins per day. Resinas Artificiales y Derivados, S.A., proposes to manufacture 700,000 square metres of plastic laminates annually. Other companies formed to engage in the manufacture of plastics include Joaquin Arola Giralt, to provide an annual output of some 200 tons per annum of various plastic products and Eugenio Corrons Rich to manufacture annually 5000 kilogrammes of plastic goods. Jesus Agell Badell plans to produce strontium and lithium compounds, the Cia. Industrial Vez & Sastre, is to manufacture 50 tons per annum of insecticides, and Juan Algarra Crespi Prats y Roquebar chiefly organic compounds.

CONTINUOUS STEEL CASTING

APPARATUS for the continuous casting of steel by which, during one relatively simple operation, the steel is brought from a liquid state to a semi-finished shape is stated to have been developed by the joint efforts of the Republic Steel Corporation and Babcock & Wilcox Tube Company.

Recent tests are said to have opened up possibilities of the utmost importance to the entire steel industry through increasing output and decentralising production by a simplification of apparatus and increasing the final yield of steel from the original melt. One advantage, offered by the new process, is the elimination of many expensive items of standard equipment required for the production of ingots, soaking pits and blooming mills.

PULVERISED COAL FIRING

High Capacity Coal-Air System in the U.S.A.

WHAT is claimed to be the largest capacity coal circulating system ever built for pulverised coal has passed initial tests and will soon be in operation at a U.S. mid-western cement plant.

The apparatus, designed and installed by the Babcock & Wilcox Company, New York, has a continuous loop of piping 275 ft. long through which the coal and air mixture from a single pulverising unit circulates continuously to the plant's four rotary kilns. Successful tests have been made in the complete simultaneous coal firing of from one to three kilns and it is possible that further experimentation with a combination of natural gas and pulverised coal in the pipe may make it possible to fire all four kilns together with a mixture which is up to 75 per cent pulverised coal.

The coal mill is an E-70 Babcock & Wilcox pulveriser, the largest single race pulveriser built by the company, standing 12 ft. high, with a windbox which has a 9 ft. 10 in. outside diameter. The capacity of the mill is rated at 18,250 lb. of coal per hour, at 50 grindability to 80 per cent minus 200-mesh fineness.

Operates Three Kilns

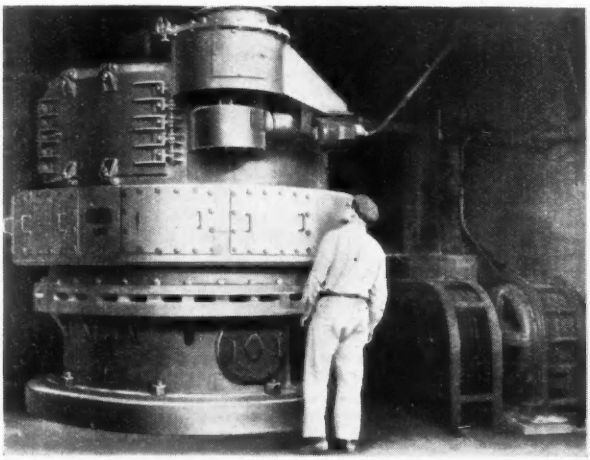
The system was designed for simultaneous firing of two kilns with a peak fuel demand of 15,240 lb. of pulverised coal per hour, but with normal kiln output and fuel demands and with average quality and grindability coal, the system meets the requirements of three kilns at once.

The distributing pipeline operates with a surplus of primary air-coal mixture which is re-circulated back to the pulveriser exhaust fan, and the pipe diameter is progressively smaller from beginning to end, which compensates for successive removals of fuel for the kilns of the line. The feeding of coal into the pulveriser and the discharge of pulverised coal into the pipeline are automatically controlled.

Minimising Fire Hazards

The circulating system which eliminates storage of the pulverised material is constructed to avoid fire hazards and to withstand an explosion pressure of 50 p.s.i. It has a high safety factor and, should an explosion occur, the fire is carried through the burner pipes to the kilns.

"With successful operation of this installation," Babcock & Wilcox officials said, "the field for economical application of pulverised coal as a fuel is expanded, and the practicability of loop lengths up to 1000 ft. is indicated. The direct-fired circulating system is particularly valuable where there are many furnaces of small capacity located some distance apart. This is true of the chemical, cement and lime, and metallurgical industries."



The massive yet compact mechanical stoker in which the coal is pulverised at a rate of more than 18,000 lb. per hour and fed by forced draught to four kilns, the number of which might be increased by employing gas-enriched air

American Chemical Notebook

From Our New York Correspondent

WHAT may prove to be the "gold rush" of the twentieth century was the discovery, recently, of uranium ore in mountainous Marshall Canyon, north of Beaumont, California, by Mr. B. Marshall, cattle rancher. This has attracted many prospectors, who are staking claims to land throughout the region. Mr. Marshall's search for uranium was encouraged by the recent announcement made by the U.S. Atomic Energy Commission guaranteeing a $10,000 bonus for any discoveries of 2 per cent uranium trioxide ore in quantities exceeding 20 short tons. Final confirmation of the discovery is dependent upon the delivery to the Atomic Energy authorities of a 10 lb. sample of his ore.

* * *

Marking the 24th in the series of chemical product safety manuals being issued under its sponsorship, the Manufacturing Chemists' Association of America recently published Chemical Safety Data Sheet SD-24 on Perchloroethylene. Designed for supervisory staffs and management, the manual sets forth important physical and chemical properties, outlines shipping containers and recommends methods for loading and unloading, in addition to containing information regarding safe handling of the chemical. In a section prepared by the medical advisory committee of the association, health hazards and their control are dealt with. Copies of the new manual may be purchased at 20 cents each from the Manufacturing Chemists' Association, 246 Woodward Building, Washington 5, D.C., U.S.A.

* * *

Canada Resins & Chemicals Co., Ltd., has announced that its new plasticiser plant, the first of its kind in Canada, will soon be in production at Shawinigan Falls. At present plasticisers are imported into Canada from the U.S.A. and the new plant will assist in making the country less dependent upon American supplies. The firm also has plans for the construction of a new factory for the manufacture of thermosetting resins and an expansion of its existing vinyl resin plant.

* * *

Amplifying the news of the purchases by the Indian Tata industries in the U.S.A. (THE CHEMICAL AGE, August 21), it is now announced that Tata Chemicals, Ltd., Bombay, has already purchased a CO_2 compressor for $34,000 and the Tata Oil Mills has placed an order for structural steel work for its new hydrogenation building in Bombay, and two new boiler units for this plant have been purchased at a cost of $110,000. A number of heavy cranes and steel plant are also being bought for Tata Iron & Steel Company, Ltd., Jamshedpur, where a $550,000 modernisation programme is contemplated. Further large purchases of capital equipment in the U.S.A. during future months are expected.

* * *

Because of mounting costs which have more than doubled the estimated capital investment required, President E. F. Bullard, of the Stanolind Oil and Gas Company, announced recently that plans to erect an $80 million synthetic petroleum and chemical plant at Garden City, Kansas, have been cancelled. The proposed plant was to manufacture 6000 barrels of diesel fuels and 400,000 lb. of chemicals a day from dry natural gas. The company has, however, retained the original plant site and plans are being formulated which may permit reinstatement of a similar programme approximately three years from now. Meanwhile Stanolind's other construction projects are continuing. These include the chemical plant at Brownsville, Texas, and a natural petroleum plant near Ulysses, Kansas.

* * *

United States production levels of inorganic chemicals for June, although slightly lower than for the preceding month of May, 1948, were about the same as for June, 1947, according to the U.S. Bureau of the Census. Decreases from May, 1948, quantities were reported for 23 of the 35 chemicals included in the monthly survey, while increases were reported for only 12. In comparison with June, 1947, figures, 18 chemicals were produced in smaller quantities and 17 in larger amounts. The June production of chlorine, electrolytic sodium hydroxide, and molybdate chrome orange, reached record high levels.

* * *

Domestic consumption of new rubber in the United States of America during 1948 is expected to total approximately 1,050,000 tons, according to the U.S. Department of Commerce. The total includes 625,000 tons of natural rubber. The Department estimates that foreign demand for natural and synthetic rubber is expected to total about 825,000 long tons, leaving approximately 1,175,000 long tons of new rubber materials available to the United States.

Home News Items

Royal Support for British Exhibition.—The Duke and Duchess of Gloucester have accepted King Frederik of Denmark's invitation to attend the opening ceremony of the British Exhibition in Copenhagen on September 18. H.M. the King and H.M. King Frederik are patrons of the exhibition.

Explosion at Earlestown.—One woman received injuries which later proved fatal, and six others were injured, when an explosion occurred in the detonator room at the Colliery Explosives Company's premises, Vista-road, Earlestown, last week. All were employed as packers. Windows in the room were blown out, and the roof was damaged.

New Coal Borings.—Boring operations which were started by the National Coal Board in the Wrexham area last year are being continued on the borders of Shropshire. A new bore-hole has been started at a point east of Ifton Colliery, Chirk, and has already reached a depth of 250 ft. The new shaft may finally be taken to about 4500 ft.

Cyanide Pollution?—Hundreds of dead fish, chiefly roach and dace, floated into the Thames from the Hogsmill river at Kingston last week. Mr. H. T. Perry, chief sanitary inspector at Kingston, said he suspected poisoning through the inadvertent discharge probably of a small quantity of potassium cyanide into the river. The Thames Conservancy Board has been notified.

Fuel Oil Shortage.—Fuel oil equipment engineers in Scotland report that there has been a marked decline in conversion work following on the refusal of the Government to assure adequate fuel allocations. A number of firms in the heavy industries and textiles, which converted to oil, are now having to reconvert or to use oil at very heavy cost. The major use of oil is currently for marine engines, demand for which continues at a very high level.

Thomas Gray Memorial Trust.—The Council of the Royal Society of Arts offers the following awards under the Thomas Gray Memorial Trust. A prize of £50 for an essay, on "The Applications of Radar to Navigation." The competition is open to persons serving in the British Merchant Navy. An award of £50 is also offered to any member of the British Merchant Navy for any act "of outstanding professional merit" during the year ending September 30, 1948.

Best August Coal Output.—Last week's output of deep-mined coal was 3,753,700 tons, the highest August week total since 1942. Absenteeism fell from 11.69 per cent to 7.70. Opencast production was 200,500 tons, a fall of 10,600 tons on the previous week. Output of deep-mined coal during the previous week was 3,568,000 tons.

Big Order for Scientific Glass.—A record consignment of miscellaneous laboratory glass equipment, valued at £6000, has been sent to Australia by Quickfit & Quartz, Ltd. (subsidiary of the Triplex Safety Glass Co., Ltd.). This shipment, says the company, illustrates the extent to which the industry has captured oversea markets formerly held by Germany.

New Foundry at Crewe.—In a recent report dealing with the establishment of a new steel plant at Crewe, the name of the firm concerned was inadvertently given as "British Toolmakers' Corporation" (THE CHEMICAL AGE, August 14). This should have read, "The British Rollmakers Corporation, Ltd.," the organisation which controls five roll foundries, one in Scotland and four in the Midlands.

Scottish Aromatics.—The Scottish perfumery industry has achieved a remarkable degree of post-war success and shows every indication of consolidating its favourable position. One interesting development is the cultivation in Scotland of aromatic plants for sale for extraction purposes. One large Glasgow concern is now employing Australian and American subsidiaries to handle the disposal of its products in those countries.

READERSHIP IN ELECTRONICS

THE Mullard Company's recognition of the necessity for industrial organisations to accept some measure of responsibility, and to assist actively in the problems of the future education of electrical engineers, has prompted them to take practical steps in this connection by offering to finance a Readership in Electronics at the City and Guilds College of Imperial College. The authorities of the University of London have accepted the offer. The Readership will be mainly concerned with post-graduate teaching of research.

Personal

MR. J. N. DOUGHTY, chief chemist at Dundee corporation gasworks, has been appointed assistant chief chemist to Salfo 1 corporation gas department.

MR E. S. JOHNSON, sales manager of The 1 orestal Land, Timber & Railways Co., Ltd., has been appointed additionally to the chairmanship of the board of The Calder & Mersey Extract Co., Ltd.

The Federation of British Industries has announced that its president, SIR FREDERICK BAIN, deputy chairman of I.C.I., Ltd., will be the representative of chemical industry on the Anglo American Council of Productivity.

MR. WILLARD H. DOW, president of the Dow Chemical Company, Midland, Mich., has been awarded the Medal for the Advancement of Research for 1948 by the American Society for Metals. The presentation will take place at the annual banquet of the ASM in Philadelphia on October 28.

The Pharmaceutical Society's research scholarship of £250 a year for two years has been awarded to MR. GERTH WILLIAMS, B. Pharm. (London), demonstrator in pharmaceutics in the society's college. The Allen and Hanbury research fellowship of £250 has been awarded to MR. YU CHUN HSU, B.Pharm.(London), who holds the diploma in pharmacy of the National School of Pharmacy in China.

The election of MR. ARNOLD H. SMITH, a noted rubber research and chemical expert, as president of Monsanto (Canada), Ltd., Montreal, was announced by Mr. William M. Rand, president of Monsanto Chemical Co He also announced that MR. LEO G. RYAN would remain as chairman of the board. Mr. Ryan, who has been largely responsible for the growth of the Canadian companies, has been president since 1933. Concurrently, MR. L. E. RYAN was elected first vice-president of the company. A graduate of McGill University, Mr. L. E. Ryan has been associated with Monsanto (Canada) since its formation in 1946 and remains in charge of manufacturing and development programmes.

Opposition to Proposed Lime Plant.—The Lancashire executive of the Council for the Preservation of Rural England is to ask the Ministry of Town and Country Planning to intervene in the proposal to construct a lime processing plant on Padiham Heights, overlooking Sabden Valley.

"Culture in Chemistry"

British Association's Discussion Programme

THE 110th annual meeting of the British Association will be held this year at Brighton, September 8-15. The programme for the chemical section is as follows:—

Thursday (September 9).—Joint discussion with the agricultural section on the maintenance of the world food supply.

Friday (September 10).—Discussion on the newer metals and alloys in industry. Various speakers, including Dr. C. H. Desch, will address members on this subject and an exhibition of metals and alloys will be on view.

Monday (September 13).—Presidential address by Prof. John Read on "Specialisation and Culture in Chemistry," followed by a discussion on the conservation of the chemical elements. One of the principal speakers will be Prof. J. D. Bernal.

The chemical section's dinner will be held on Saturday, September 11, at the Old Ship Hotel. Tickets can be obtained from Dr. T. J. Morrison, 12 Surrenden Close, Brighton 6.

Obituary

MAJOR H. EDGINGTON, chairman of the rubber producing company, Kerala Calicut Estates, has died after a long illness. He was a member of the Council of the Rubber Growers Association.

MR. ROBERT MACLAURIN, a founder Fellow of the Institute of Fuel, collapsed and died last week in a bus at Glasgow. He was educated at what is now the Royal Technical College, Glasgow, and was chemist for some years to the Cassel Cyanide Co. He conducted research into the preparation of polyhydric phenols from coal tars in conjunction with the dyeworks at Grangemouth. He is best known as the designer of the Maclaurin internally-fired, low temperature carbonisation plant, which supplied gas for Nuneaton for many years. Maclaurin Coal Products, Ltd., erected similar plant in the Glasgow Corporation gasworks, but litigation ensued and the results of the tests cannot be said to have been conclusive. In recent years Mr. Maclaurin had resumed interest in the question of peat distillation.

New Belgian Oil Refinery.—Arrangements are in progress for the erection of a petroleum refinery at Antwerp with an annual capacity of 1.3 million tons. The capital for the new project, about Frs. 1000 million, has been contributed equally by Belgian and British interests.

Overseas News Items

Australia Buys U.K. Coal.—The Victorian Government has purchased 120,000 tons of British coal for general industrial purposes, including the making of cement and for brick works. The first shipment of 7000 tons, will leave early next month.

Italian Exports.—During the first half of the current year Italian exports of mercury increased to 405 tons (362 tons during the first half of 1947). Exports of tartaric acid, registered a drop from 975 to 468 tons and those of paints and varnishes fell from 800 to 664 tons.

Timber Distillation in the Argentine.—The Argentine National Department of Vegetable Fuels is building six experimental factories for the distillation of dry timber. A large industrial plant will be set up to distil molasses with a view to obtaining ethylic alcohol which, mixed with naphtha, might be used as motor fuel.

Polish Chemical Output.—The value of Poland's chemical output during the first six months of this year amounted to about 486 million zloty, at pre-war values. Soda output was 92,000 tons, compared with 141,000 tons for the whole of 1947, and superphosphate 114,000 tons, against 183,000 tons for 1947.

Unwanted Coal.—The Carbonifera Sarda mines in Sardinia have recently been faced with the problem of being unable to market their output of brown coal, about 200,000 tons of which has accumulated locally. The mine authorities are pressing the government to adopt a scheme whereby consumers would be obliged to accept 10 per cent of brown coal with all consignments of coal.

Niobium-Ore Mining Resumed in Germany.—The mining of niobium-ore, in the form of columbite, has recently been resumed in the Kaiserstuhl mountain, Baden, Germany. The deposits are said to be among the largest in Europe. Owing to the special properties of niobium metal and enlarged demand, its price has increased considerably in recent years.

Australian Bauxite.—The Australian aluminium production commission is considering the exploitation of extensive bauxite deposits at Inverell, believed to be the largest in the Dominion. If it is decided to work the deposits, a plant will be erected and the alumina extracted will be shipped to Tasmania for electric reduction to aluminium metal. Such a plant would be in production in 1951 and would have an annual capacity of 10,000 tons.

U.S. Rayon Production.—The U.S. rayon producing industries reached a total output in the second quarter of 1948 of 278.9 million lb., 4 per cent more than in the first quarter and 17 per cent higher than output in the second quarter of 1947. This is the eighth consecutive quarter to show higher production.

New Brazilian Chlorine Plant.—Belgian interests have erected a plant near Santo André, Brazil, to produce liquid chlorine and its derivatives. This factory is the first of its kind to be established in the State of S. Paulo and will also produce benzine hexachloride, now being used as an insecticide in the coffee plantations.

Italian Cement.—The output of Portland cement in Italy, during the first quarter of the current year, has increased to 591,049 tons (456,930 tons in 1947). Despite the present favourable supplies of fuel, electric power and various materials, the total output during 1948 is, however, no longer expected to reach 4½ million ton level planned. Experts expect no more than three million tons.

Swiss Work in Nuclear Physics.—Experiments have been taking place for some time in Switzerland, chiefly at the Federal Technical Institute (ETH) in Zurich and at Basle University, concerning the technical utilisation of the heat produced in nuclear reactions. A betatron of 30 megavolts has been constructed in order to carry out radiation experiments. It is intended to construct further betatrons for therapeutical purposes.

Electro-Chemical Research in India.—Speaking at a ceremony connected with the laying of the foundation stone of the Indian Electro-Chemical Research Institute, Dr. Bhatnagar (Department of Scientific Research) emphasised the importance of a specially-equipped national laboratory of this type and predicted that India's abundance of basic raw materials and cheap labour would lead to the rapid growth of the country's electro-chemical industries.

Belgian Metal Industry.—Belgium has at present 44 blast furnaces working and it is hoped to start two more in October. Steel output for July is expected to reach about 340,000 tons. The Union of South Africa and Argentina are reported to have been particularly good markets; out of a total Argentine steel import of 870,000 tons, Belgium supplied some 150,000 tons. French competition is increasingly being felt.

D

COMPANY MEETING

Benn Brothers, Ltd.

Trade Journals Essential to Industry

THE fifty-second annual general meeting of Benn Brothers, Ltd., (proprietors of THE CHEMICAL AGE and associated journals) was held at Bouverie House, Fleet Street, London, E.C.4, on August 23, with Mr. Glanvill Benn, chairman, presiding.

In the course of his speech, Mr. Benn said :—

" The profit on trading is again the largest in the long history of the company.

" Of the net profit of £129,193, rather more than 50 per cent is paid direct to the Exchequer while the shareholders receive £24,261, or a little less than 20 per cent of the fruits of their enterprise.

" The immense financial strength of the company as shown in the balance sheet and consolidated balance sheet is, of course, not only the result of a successful year 1947-48, but even more the result of the prudent and conservative accounting policy which has always been followed by this company.

" To-day, however, directors of conservatively financed private enterprises may well decide that they should submit their policy afresh to shareholders. Many may feel in the light of recent events that nowadays the extravagant are rewarded and the prudent penalised.

" There are plenty of examples of the truth of that statement; the Government's treatment of the gas industry being only the latest and one of the most striking. As the publishers of *The Gas World* we may claim to know something about this affair. Gas undertakings are to be acquired by the Government at their book values, which means that the shareholders in the well managed undertakings are being robbed.

Book Values

" Should the present Government last long enough to carry out its declared policy of socialising industry, whatever else that typically loose and sloppy expression may mean, it is at least certain to mean that many successful commercial and business enterprises—publishing perhaps among them —will be acquired at no more than their book values.

" The unnecessary limitation of dividends increases the difficulty of resisting the tendency towards increases in other expenditures which may rise beyond the powers of the future to meet. While a dividend can always be reduced, it is not so easy to reduce the price of purchases.

" The case for continuing our prudent financial policy is also supported by the fact that publishing is a highly speculative business. The excellent financial results of recent years may lull some people into forgetfulness of that point. The special conditions operating since 1939 have indeed disguised the fact to a large extent but it remains fundamentally true. Even while these war-time conditions continue to operate in our favour, it should be remembered that we are still at the mercy of the real censors of the Press—the bureaucrats who decide our paper ration.

Specialised Publishing

" The company's holding of gilt-edged securities is now considerable. Shareholders' money in a publishing company, however, should be in paper and print, not in securities. Our activities with our existing publications are limited by our paper ration, but your directors will not be slow to acquire other publications or to start new ones should opportunities come their way. Intense concentration over the past sixty-eight years on the production and publication of specialised trade journals serving many of the most important industries of the country, places your company in a most favourable position to take advantage of openings of that kind.

" In this connection it may not be inappropriate to mention that, quite apart from the financial strength of the company, we may also take some pride in our technical strength. Sir Ernest Benn, who built up the business to its present size, is still a working director and there are five other whole-time working directors, fourteen editors and sixteen managers. The combined length of service with the company of these thirty-six gentlemen is 588 years. I cannot help wondering whether there is any other publishing company of comparable size that has a greater fund of knowledge and experience at its disposal.

" During the past year, steady progress has been made in all departments of your business. The Benn journals, packed with information, have been produced up to the permitted limits of size and circulation. In addition, several most important works of reference have been published.

" The Benn publications have been shown, as usual, at the leading specialised and industrial exhibitions, and were the subject of the only individual display by a London publishing house at the Toronto Trade Fair. *Fire Protection and Accident Prevention Review* has joined your group. This development coincides with the reorganisation of the Fire Service, the growing appreciation of the need to reduce industrial accidents, and the realisation that Civil Defence forms the country's 'Fourth Arm.' "

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

DEVONSHIRE BARYTA CO., LTD., London, E.C., manufacturers of sulphate of barium. (M., 28/8/48.) July 16. £20,000 debenture to Laporte Chemicals, Ltd.; general charge. *Nil. August 20, 1947.

ROBERTS WINDSOR SOAP CO., LTD., Windsor. (M., 28/8/48.) July 21, debenture to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; general charge. *Nil. June 7, 1948.

Company News

The nominal capital of **Ryber Laboratories, Ltd.,** Beach Road, Tankerton, Kent, has been increased beyond the registered capital of £5000 by £20,000, in 1s. "B" shares.

The nominal capital of **National Plastics, Ltd.,** 555 Salisbury House, London, E.C.2., has been increased beyond the registered capital of £1,500,000 by £500,000 in 10s. ordinary shares.

The name of **Clemrow Trading Co., Ltd.,** 200a High Street, Colliers Wood, London, S.W.19., has been changed to Seelig Trading Co., Ltd., as from July 29, 1948. The name of **C. G. Fox & Co., Ltd.,** 7, 8 & 9 St. James' Street, London S.W.1, has been changed to Verpine Company, Ltd., as from August 3, 1948.

New Companies Registered

Woodall-Duckham, Ltd. (457,868).—Private company. Capital £800,000. To acquire the business carried on by Woodall-Duckham (1920), Ltd., and to carry on the business of consulting, gas, mechanical, electrical water supply and chemical engineers. Solicitors: Holmes, Son & Pott, 301 Salisbury House, E.C.2.

J. B. Wilkinson (Chemicals), Ltd. (457,695).—Private company. Capital £25,000. Manufacturers and importers of chemical and other preparations, etc. Directors: F. Wilkinson, N. Wilkinson and S. Wilkinson. Reg. office: Dudley Hill Chemical Works, Holme Lane, Dudley Hill, Bradford.

Alton Peat Industries, Ltd. (26,491).—Private company. Capital £1000. Preparers and sellers of peat for the purpose of preparation or manufacture of chemical products, etc. Directors: J. Allen and Dr. J. R. Allen; D. Dutton and A. M. Hutton. Secretary: J. Allen. Reg. office: Leckethill Moss, Chryston, Glasgow.

Chemical and Allied Stocks and Shares

THE continued absence of news of the outcome of the Moscow talks kept business in stock markets at a low ebb, buyers being extremely cautious except in the gilt-edged section. Further investment buying again strengthened 3 per cent Transport and other nationalisation stocks. Industrial shares were firmer, with movements in many cases not exceeding more than a few pence. The quiet and inactive conditions ruling in markets have been illustrated by the trend in Imperial Chemical new shares, which after starting at 3s. 9d. premium last week, have now changed hands down to 2s. 9d. premium over the issue price of 40s. 6d. as compared with 44s. 3d. for the old shares. The new shares represent an attractive means af acquiring an interest in I.C.I., and when markets become more active, it is expected there will be some transfer of investment from the old to the new shares.

Monsanto Chemicals were 57s. 6d., Fisons 58s., and Laporte Chemicals 5s. units were 20s. 7½d. William Blythe 3s. shares have changed hands at 18s. 3d., Boake Roberts at 30s. and Burt, Boulton & Haywood at 26s. 3d. Business up to 15s. was recorded in Lawes Chemical 7 per cent 10s. preference. Elsewhere, Amber Chemical 2s. shares were 8s. 6d. with the 5 per cent preference 25s. Albright & Wilson 5s. shares changed hands around 28s. 3d. Lever & Unilever eased to 48s. 6d., British Aluminium were firm at 47s. and British Oxygen were 97s. 6d., awaiting the interim dividend. United Molasses were around 48s. and the units of the Distillers Co. steady at 26s. 3d., in anticipation of the full report and accounts, which will probably be published by the time these notes are in print.

British Plaster Board changed hands around 24s. 7½d. and Triplex Glass at 24s. 9d. lost part of their recent advance. Turner & Newall were 75s. 3d. and among

paint shares, International Paint in their new denomination of 4s. units changed hands around 31s. 3d.

In response to the good impression created by the first consolidated accounts, which showed resources in excess of general market estimates, Wm. Cory shares have strengthened to 88s. Guest Keen were 45s. 9d., United Steel 28s., Dorman Long 30s. and Colvilles 33s 1½d. Ruston & Hornsby came back to 51s. 9d. Iron and steel shares generally have been maintained because, although the City fears that a Bill for nationalisation can be expected to be introduced before the end of this year, nationalisation of the industry cannot be carried out before 1950. Babcock & Wilcox firmed up to 66s. 6d. and in other directions, Powell Duffryn were 28s. 9d. Metal Box shares, however, receded to 98s. 9d.

Among other shares, those of companies connected with plastics were generally steady, although De La Rue eased to 38s. 9d. British Xylonite came back to 98s 9d. but British Industrial Plastics 2s. shares were steady at 6s 10½d.

Glaxo Laboratories were £17, British Drug Houses 5s. ordinary 8s. 6d. and Boots Drug 5s. ordinary 51s. 6d. Borax Consolidated remained at 58s. 1½d. and Sangers 5s. shares have strengthened to 29s. 6d. Coalite & Chemical 2s. ordinary continued to change hands around 4s.

Oils moved irregularly, but recorded only small changes on balance. Anglo-Iranian were £8 1-16, awaiting developments in Palestine. Trinidad Leaseholds came back to 29s. 7½d. Mexican Eagle Oil eased to 14s. 9d. although first payment for the company's appropriated properties is expected from Mexico next month.

STEEL ANALYSIS

THE British Standards Institution has recently published the following parts of British Standard No. 1121, relating to methods for the analysis of steel:

Part 7. Tin in pig iron, plain carbon steels and certain low-alloy steels. Part 8. Chromium present in small amounts in carbon and low-alloy steels. Part 9. Phosphorus in high chromium-nickel steels. Part 10. Silicon in all types of irons and plain alloy steels other than high tungsten and high tungsten-molybdenum steels. Part 11. Carbon in steel and low-carbon ferrochromium.

For each method the solutions required, the test procedure and the method of calculation are specified. Copies can be obtained from the Institution's sales department, 24 Victoria Street, London, S.W.1 (1s. each post paid).

Indian Sandlewood Oil

Mysore's Record of Production

LAST year Mysore produced 43,500 lb. of sandalwood oil from 488 tons of wood. The efficiency of distillation was maintained at the peak level of 97 per cent and the gross revenue for the year, Rs.1.4 million, was an all-time record. The demand for sandalwood oil in the Indian market has slackened considerably because soap manufacturers, faced with an acute shortage of caustic soda, have reduced their production programmes. The imposition of import duties throughout the world has also begun to affect the volume of business with foreign countries. In the perfumery market the pressure of inferior oils is increasing, and in the American market a synthetic sandalwood has recently established itself.

During the last 20 years Mysore produced 4.8 million lb. of sandalwood oil from 45,000 tons of wood supplied by the forestry department. The sub-continent's first factory was opened at Bangalore in 1916 following research by the applied chemistry branch of the Indian Institute of Science. A year later a second and larger factory at Mysore commenced operation, and as the demand for sandalwood oil increased two more distilleries were set up. Analysis of the oil produced is carried out by qualified chemists and only oil fulfilling customers' specifications is sent out under a Mysore Government guarantee.

BETTER METAL YIELDS

ENCOURAGING reports on non-ferrous metal production appeared from two sources recently. In his annual statement to shareholders, Mr. J. R. Govett, chairman of New Broken Hill Consolidated, Ltd., said that during 1947 ore production from the company's leases totalled 62,367 tons, of which 47,511 tons came from the zinc lode and 14,856 tons from the lead lode. This tonnage excluded 45,405 tons purchased from the Zinc Corporation, Limited, under the Sale of Ore Agreement. A Malayan report stated that the recent outbreak of terrorism was not now seriously affecting tin production and the July output of tin ore was expected to exceed 5000 tons, compared with 4762 in June.

Swedish Iron and Steel Prices.—The Swedish Price Control Office has recently authorised an average increase of 8 per cent in the price of iron and steel products, high-grade steel excepted. The increase in the price of scrap and pig iron is said to be the chief cause for this increase, the first since the general price stop introduced in 1942.

Prices of British Chemical Products

THERE has been very little change in the trading conditions on the industrial chemicals market during the week and nearly all sections report a steady inquiry for new business. The recent restriction on the export of dyestuffs is likely to ease the position for the home textile industry, and a strong demand is reported. The export trade shows no signs of contraction in business and a substantial flow of overseas buying orders is in circulation. Price changes have been few and unimportant, and the undertone remains strong. Pitch and creosote oil are again the chief active items in an unchanged coal tar products market.

MANCHESTER.—Steady or firm price conditions have been maintained in virtually all sections of the Manchester chemical market, and the seasonal factors are still operating. Trading has been fairly active. Chemicals for the textile, bleaching, dyeing and finishing trades in Lancashire have met with a good demand. Other industrial users are also calling for steady deliveries, and replacement buying during the last month has been fairly extensive. Shippers have also displayed additional interest in a wide range of products, chiefly for the dominion and colonial outlets. Trade in fertilisers has been moderate to fair, and in the tar products section a generally brisk inquiry has been reported with prices on a firm basis.

GLASGOW.—There has been little change in the Scottish chemical market during the week, activity having been confined mainly to normal buying, with no unusual demand. Supplies of coal tar products have been fairly well absorbed and there seems to have been little increase in the demand for soda ash, although rationing has been removed. There was a temporary increase, but indications are that future demands will not be excessive. There has been considerable activity in the export market and this week has been very satisfactory from the point of view of confirmations of orders received, particularly from the dollar countries. There is still an unsatisfied demand for solvents.

Price Change

Rise: Carbolic acid.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton, £64; 80% pure, 1 ton, £66; commercial glacial 1 ton £79; delivered buyers' premises in returnable barrels: £4 10s. per ton extra if packed and delivered in glass.

Acetic Anhydride.—Ton lots, d/d, 11¾d. per lb.

Acetone.—Maximum prices per ton, 1/5 tons, £76 10s.; single drums, £77 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 7⅞d. per proof gallon; 5000 gal. lots, d/d, 2s. 10⅛d. per proof gal.

Alum.—Loose lump, £16 per ton, f.o.r. MANCHESTER: £16 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate. — MANCHESTER: £46 per ton d/d.

Ammonium Carbonate.—£42 per ton d/d in 5-cwt. casks. MANCHESTER: Powder, £50 d/d.

Ammonium Chloride. — Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Antimony Oxide.—£162 10s. per ton.

Antimony Sulphide.—Golden, d/d, as to quantity, etc., 4s. to 5s. per lb.

Arsenic.—Per ton, £40 5s. to £41 5s., according to quality, ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £25 15s. per ton, bag packing, ex works.

Barium Chloride.—98/100% prime white crystals, 5-ton lots, £26 per ton, bag packing, ex works.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £26 10s. per ton d/d; 2-ton lots, £26 15s. per ton.

Bleaching Powder.—Spot, 35/37%, £11 10s. per ton in casks.

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £30; crystals, £31; powdered, £31 10s.; extra fine powder, £32 10s. B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £52; crystals, £53; powdered, £54; extra fine powder, £56. B.P., crystals, £61; powder, £62; extra fine, £64.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £5 15s per ton, ex store.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£29 per ton, d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 5½d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 6s. 7d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 8d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 10d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 8d. per lb.

Copper Sulphate.—£42 10s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., from 201s. to 205s. per cwt. lots, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £115 per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £64 per ton for ton lots, carriage paid. 90%, £67 5s. per ton.

Glycerine.—Chemically pure, double distilled 1260 s.g., 123/1 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale, tech., £75 per ton; dark tech., £65 per ton ex works; barrels returnable.

Lead Acetate.—White, 110s. to 115s. per cwt., according to quantity.

Lead Carbonate.—British dry, ton lots, d/d. £116 per ton.

Lead Nitrate.—About £115 per ton d/d in casks. MANCHESTER: £115.

Lead, Red.—Basic prices per ton: Genuine dry red lead, £106; orange lead, £118. Ground in oil: red, £132; orange, £144. Ready-mixed lead paint: red, £140; orange, £152 (subject to increase of £1 10s. per ton).

Lead, White.—Dry English, in 8-cwt. casks, £116 10s. per ton. Ground in oil, English, in 5-cwt. casks, £141 per ton.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d, £22 to £25 per ton.

Litharge.—£103 10s. to £106 per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £18 5s.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £27 10s. per ton.

Magnesium Oxide.—Light, commercial, d/d. £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., for 2-cwt. lots, 7s. 6d.; smaller quantities dearer.

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 4s. 10d. per gal.; pyridinised 64° O.P. 100 gal., 4s. 11d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—Nominal.

Phosphoric Acid.—Technical (S.G. 1.500). ton lots, carriage paid, £61 per ton;

B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9¾d. per lb.; ground, 10¾d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent. 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 8s. 8d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 8½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 8d. per lb.; technical, £7 14s. 3d. to £8 6s. 3d. per cwt., according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s. 1d. per lb. d/d.

Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£41 per ton, ex wharf.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £28 7s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£45 to £47 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals 22s. 6d. per cwt. (2-ton lots); commercial, 1-ton lots, £16 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., 10s. 2d. per lb. to 12s. 1d. according to quantity.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £103 ton.

Sodium Metasilicate.—£19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £19 15s. per ton.

Sodium Nitrite.—£22 per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt. in 1-cwt. drums.

Sodium Phosphate.—Di-sodium, £32 10s. per ton d/d for ton lots. Tri-sodium, £62 per ton d/d for ton lots.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £4 15s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £23 per ton, d/d, in drums; broken, £23 15s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £14 12s. 6d. to £16 17s. 6d., according to fineness.

Sulphuric Acid.—168° Tw., £6 10s. 2d. to £7 10s. 2d. per ton; 140° Tw., arsenic-free, £5 2s. 6d. per ton; 140° Tw., arsenious, £4 15s. per ton. Quotations naked at sellers' works.

Tin Oxide.—1-cwt. lots d/d £25 10s.

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags), £97 per ton.

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £75 10s.; green seal, £74 10s.; red seal, £73.

Zinc Sulphate.—No quotation.

Rubber Chemicals

Antimony Sulphide.—Golden, 3s. to 4s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 3s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb, according to packing.

Carbon Tetrachloride.—£50 10s. to £53 10s. per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10½d. to 1s. per lb.

Lithopone.—30%, £33 12s. 6d. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Phosphate.—Not quoted—temporarily unobtainable.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in January, £10 5s., rising by 1s. 6d. per ton per month to March, 1948.

Calcium Cyanamide.—Nominal; supplies very scanty.

Concentrated Fertilisers. — Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £14 18s. 6d.

"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £17 5s. per ton; granulated, over 98%, £16 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8½d.; nitration grade, 2s. 10½d.

Carbolic Acid. — Crystals, 11½d. per lb. Crude, 60's, 3s. 6d. to 4s. MANCHESTER: Crystals, 10¾d. to 1s. 0½d. per lb., d/d; crude, 4s. 3d., naked, at works

Creosote.—Home trade, 6½d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6½d. to 9¾d. per gal.

Cresylic Acid.—Pale, 97%, 3s. 6d. per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 4s. 4d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra: higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 100s. per ton f.o.r. suppliers' works; export trade, £7 10s. per ton f.o.b. suppliers' port. MANCHESTER: 100s. f.o.r.

Pyridine.—90/140°, 18s. per gal.; 90/160°, 14s. MANCHESTER: 17s. to 20s. per gal.

Toluol.—Pure, 3s. 2½d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2½d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.

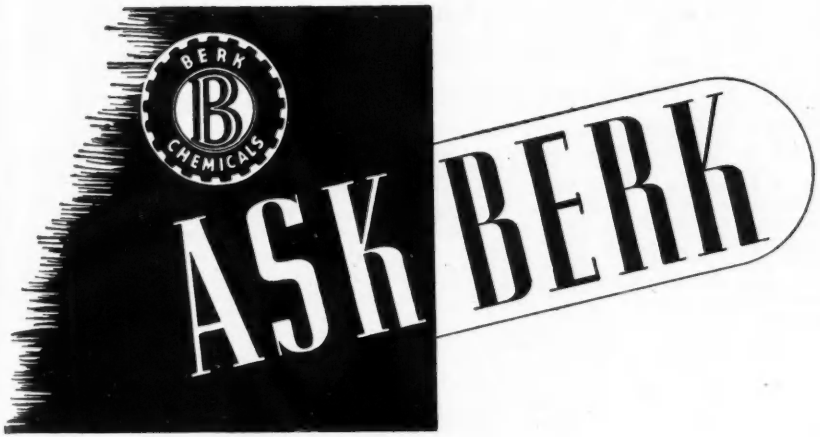
o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON.—August 25.—For the period ending September 25, 1948 (October 9, 1948, for refined oils). Per ton, naked, ex mill, works or refinery, and subject to additional charges according to package; LINSEED OIL, crude, £200. RAPESEED OIL, crude, £190. COCONUT OIL, crude, £106 refined deodorised, £112 refined hardened deodorised, £116. PALM KERNEL OIL, crude, £105 10s., refined deodorised, £112; refined hardened deodorised, £116. PALM OIL (per ton c.i.f.), in returnable casks, £99 5s.; in drums on loan, £98 15s., in bulk, £97 15s. GROUNDNUT OIL, crude, £119 10s.; refined deodorised, £114, refined hardened deodorised, 40 deg. £118. WHALE OIL, refined hardened, 42 deg., £117; refined hardened, 46/48 deg., £118. ACID OILS, Groundnut, £94; soya, £92; coconut and palm-kernel, £97 10s. ROSIN: Wood, 40s. 6d. to 48s.; gum, 56s. to 62s. 6d. per cwt., ex store, according to grade. TURPENTINE. American, 87s. per cwt. in drums or barrels, as imported (controlled price).



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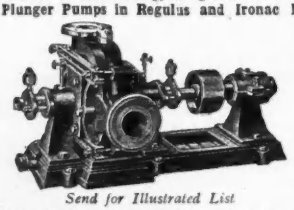

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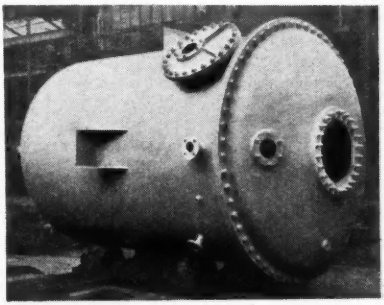

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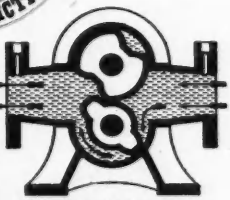

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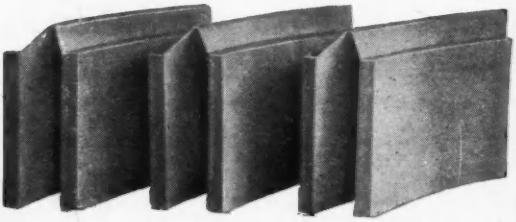

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